LONDON'S GLOBAL UNIVERSITY
ESTATES & FACILITIES DIVISION
GOWER STREET
LONDON WC1E 6BT

Design Brief for

Mechanical & Electrical and Vertical Transport Services

Prepared under the superintendence of
B. Osborn, B.Eng(Hons), C.Eng, MCIBSE
Chief Engineer
UCL

February 2011

3rd EDITION

Amendment number	*Description*	*Date*
1st Edition issue	1st Issue of Document	Sept 2005
2nd Edition issue	Contact directory updated, M&E general revisions, and vertical transportation substantially revised.	August 2009
3rd Edition issue	Contact directory updated, revisions to M& E sections	February 2011

CONTENT

A - GENERAL

A.1 Background on UCL's Support structure.

The Estates & Facilities Division along the other departments in the College provides support and advise on UCL requirements for both design and safety matters.

Liaising with all the necessary parties at UCL can often be one of the most challenging aspects of the design but is a very important requirement. To aid in this process the contact list below has been created for ease of reference.

CONTACT DIRECTORY

TELEPHONE	*NAME*	*TITLE*	*EMAIL*
020 7679 1207	Beach Greg	Director of Projects	g.beach@ucl.ac.uk
020 7679 1222	Roy Robert	Engineering Assistant Mechanical	robert.roy@ucl.ac.uk
020 7679 1240	Cooke Simon	UCL Fire Officer	simon.cooke@ucl.ac.uk
020 7679 1963	Emma Shirbon	Safety Manager	e.shirbon@ucl.ac.uk
020 7679 1229	Roy Capleton	Assistant Safety Manager	r.capleton@ucl.ac.uk
020 7679 3058	Higgs Greg	Building Supervisor	greg.higgs@ucl.ac.uk
020 7679 1245	Ilott John	Engineering Assistant Electrical	j.ilott@ucl.ac.uk
020 7679 1246	Marshall Chris	Building Services Team leader	christopher.marshall@ucl.ac.uk
020 7679 1226	Ana De'Ath	Senior Maintenance Surveyor	a.de'ath@ucl.ac.uk
020 7679 1227	Osborn Bob	Chief Engineer	b.osborn@ucl.ac.uk
020 7679 3852	Alan Shaw	Maintenance Operations Manager	alan.shaw@ucl.ac.uk
020 7679 1228	Prout Martin	Senior Engineer Operational Maintenance	m.prout@ucl.ac.uk
020 7679 1215	Vanner Jim	Deputy Chief Engineer (Design & Standards)	j.vanner@ucl.ac.uk
020 7679 6369	Paul Stirk	Head of Safety Services	p.stirk@ucl.ac.uk
020 7679 4352	David M Smith	Head of Facilities Services	d.m.smith@ucl.ac.uk
020 7679 7735	Dawe Mike	Security Systems Manager	m.dawe@ucl.ac.uk
020 7679 7321	Mark West	Senior Operations Manager - Security.	mb.west@ucl.ac.uk
020 7679 7733	Gary Sawyer	Telecommunications Manager	g.sawyer@ucl.ac.uk

020 7679 1391	Moody Sue	Communications Officer	s.moody@ucl.ac.uk
020 7679 3333	Hayden Paul	Communications Centre Manager	p.hayden@ucl.ac.uk
020 7679 7196	Hayward Nigel	Information Systems Network Manager	n.hayward@ucl.ac.uk
020 7679 6676	Allinson Mike	Audio Visual Manager	m.allinson@ucl.ac.uk
020 7679 1217	Anderson David	Energy Manager	d.anderson@ucl.ac.uk
020 7679 1261	Pollitt Steve	Assistant Energy Officer	s.pollitt@ucl.ac.uk
020 7679 1262	Plank Colin	Property Manager	c.plank@ucl.ac.uk

It should be noted that discussions and agreement with any of the above parties do not of themselves form an official instruction, and the designer is required to outline any proposals intended to be taken on board to the Project Manager (PM) and obtain the PM's formal approval.

When liaising with contacts on this list the designer shall at all times copy notes and correspondence to the PM to ensure that the PM is aware of all matters relating to the project.

A.2 General

As a minimum standard, designs are to conform to Applicable Legislation, British Standards, Industry recognised Guides and Recommendations.

Further responsibilities:-

- All equipment proposed shall be accredited to British & European Standard, carrying the CE kitemark.
- All companies shall be ISO 9001 approved.
- Full liaison with all parties including Local authority, Utility Supply authorities, National Regulating bodies etc. where required, with details of these interactions being recorded.
- Design proposal shall be employing "best practices" allowing for practical effective and safe maintenance in all cases.
- Products with suitable warranty durations should be selected.
- Selected equipment and proposed installation method must be suitable for the application and environmental conditions to prevail.
- All electrical wiring will be undertaken by NICEIC registered contractors.
- Must strive for the best low Carbon footprint solutions possible within the financial and operational brief constraints.

A.3 Performance Objectives

Principles

- A system to meet the design requirements with optimum performance achievement.
- Safety features to afford safe systems both in normal use and when being maintained.
- Systems must be simple and user friendly to operate/ manage even if the technology used is quite advanced.
- Open protocol systems to be employed where possible, suitable for being serviced by trained in-house operatives.

A.4 Building Log Books.

Building Log Books are required in accordance with section 3 of the Building Regulations Approved Document L2.

The Log Book shall be in the format of CIBSE TM31: "Building Log Books and Standard Templates" and shall be provided in electronic as well as paper format.

The building services specification shall require the contractor to produce the log book but the Building Services Engineer shall provide the contractor with all necessary design information necessary for the contractor to produce a comprehensive document. The information provided by the Building Services Engineer shall include:

(a) The preparation of section 6 "Overall Building Design"
(b) The preparation of section 10 "Occupant Information"
(c) The data required for completion of section 11 including the estimated consumption figures for energy.
(d) The data required for completion of section 12 including the estimated carbon emissions and design estimates of energy consumption.

A.5 Access for Roof Maintenance

It is a requirement that a clearance of 450mm be maintained below any item of plant, pipework or ductwork running on or across roof finishes. This is to enable roof maintenance to be carried out without the need to remove or raise services. This does not apply to plant mounted on concrete bases.

A.6 Named materials/specialists

Where particular manufacturers/specialist suppliers are mentioned in this document, this is to illustrate items/services that are proven to meet UCL requirements and to assist in minimizing stockholding of spares and specialist training of staff. The designer shall ensure the suitability of such materials or specialists for the particular scheme and remain responsible for their integration into the design. The designer is at liberty to consider alternatives and to establish whether such alternatives are acceptable to UCL, particularly if the designer has reservations about the use of such materials or specialists. The designer shall obtain approval in writing for any alternatives.

Similar provision shall be included in designers specifications used for tendering purposes to clarify that such materials or specialists are not nominated and their performance under the contract remains the responsibility of the contractor.

Passive Fire protection relating to the integrity of fire compartments, are being actively managed at UCL, to comply with obligations under the Regulatory Reform (Fire Safety) order. Designers must ensure compliance with the requirements set out in UCL Fire Technical Note No. 066A.

A.7 Other Applicable UCL Technical Documentation

Detailed technical documentation should be consulted where these apply and in the absence of specific information for particular systems being covered by this document.
In particular:-

- Design and Refurbishment of Radiation Laboratories (LR 16)
- Relevant "FIRE SAFETY ADVICE" documents (downloadable from http://www.ucl.ac.uk/efd/efm_www/maintenance/fire/)
- UCL's Power Monitoring Specification (for Networked electricity meters)
- UCL's Specification for Structured Cabling System (from ISD Nigel Hayward)
- UCL's Specification for the installation of turnstiles and their integration with Cardax access control system.

A.8 HEFCE Funding

The Higher Education Funding Council for England (HEFCE) has declared that performance in reducing carbon emissions will influence capital allocations from 2011. HEFCE has commissioned research that will recommend targets and help develop a strategy for reducing emissions.
The work will include the development of guidance for institutions such as UCL on preparing carbon plans; this guidance is due to be published in summer 2009.
HEFCE will adapt its Capital Investment Framework so that institutions can be assessed by mid-2010.
In the meantime feasibility studies and cost plans for new build and substantial refurbishment projects shall be required to consider carbon reduction proposals to ensure that applications for funding demonstrate UCL's commitment to reducing its carbon footprint.

New Construction

The design team for new construction projects shall ensure that they comply with current Building Regulation Part L2A and shall ensure that they achieve the Target CO_2 Emission Rate (TER) as calculated using an approved calculation tool. In addition targets determined by current legislation (planning guides etc) shall also be complied with.
Designers shall also investigate if further reductions in CO_2 emission are achievable. A feasibility report shall be prepared advising on potential energy and CO_2 emission reduction that can be achieved within reasonable financial constraints. Designers shall not only investigate Low or Zero Carbon energy sources but must also show that other factors have been considered. These include items such as reducing demand and influencing the built form and envelope.

Refurbishments of Existing Buildings

All refurbishments of existing Buildings shall comply with the current Building Regulation Part L2B and where applicable Part L2A.
Designers for refurbishment projects shall apply all reasonable measures to reduce CO_2 emission and shall refer to Energy Log Book and Display Energy Certificates of the existing Building to advise on potential energy and CO_2 emission reductions.

A feasibility report shall be prepared advising on potential energy and CO_2 emission reduction that can be achieved within reasonable financial constraints.

ELECTRICAL SERVICES
SECTION B - CONTENT

B.1 DESIGN CRITERIA

B.1.1 H.V. Electrical System

High voltage networks and systems do not normally form part of the work remit of installations conducted at UCL.

A H.V. ring exists on UCL's main campus site as part of a CHP system owned and operated UCL.

Any electrical alterations or upgrades that require connection to a substation / Main switchroom are to be carried out in accordance with the Electricity Safety Quality and Continuity Regulations 2002, upon getting prior approval for this arrangement from the UCL Project manager.

In the rare cases where H.V. equipment and switchgear is to be incorporated in the UCL design these should comply with all relevant standards.

B.1.2 L. V. Electrical Supplies

In accordance with the Electricity Safety Quality and Continuity (ESQC) (Amendment) Regulations: 2006, the designer, in so far as it is necessary, is required to liaise with the parties outline within the said document, in relation to L.V. supply requirements.

Consultation to be carried out with the following when negotiating a new supply connection:

a. The Supply Authority
b. The Metering company
c. UCL's Energy Section (Steve Pollitt)
d. UCL's Property Manager (Colin Plank) {for lease agreement matters}

The designer is required to investigate and design for :-

- Installed load for an existing facility (where applicable)
- Proposed additional loads
- Nature and characteristic of proposed loads
- The capabilities of the existing electrical infrastructure
- The completeness and security of the existing protective earthing system.
- The load balancing of the existing system Discrimination assessment on existing and proposed protective devices on the complete system.

<table>
<tr><td>Specific Criteria</td><td></td></tr>
<tr><td>Voltage</td><td>400V, 3phase 50Hz / 230V, 1phase 50Hz</td></tr>
<tr><td>Volt drop tolerances
(i) Supplied directly from public LV distribution.
(ii) Supplied from private LV supply (with condition outlined in BS7671)</td><td><table><tr><td>Lighting</td><td>Other uses</td></tr><tr><td>3%</td><td>5%</td></tr><tr><td>6%</td><td>8%</td></tr></table></td></tr>
<tr><td>Power Factor Correction (pf)</td><td>>.95</td></tr>
<tr><td>Total Harmonic Distortion</td><td>5% of Fundamental</td></tr>
<tr><td>Individual odd Harmonic Distortion (max)</td><td>4%</td></tr>
<tr><td>Individual even Harmonic Distortion (max)</td><td>2%</td></tr>
<tr><td>Earth impedance at earth electrode</td><td>< 1 ohm</td></tr>
</table>

B.1.3 Electricity Generating Plant

The Private Generation associated with the CHP system is for Base load support and has no allowance for exporting to the Grid. The system will not operate in island mode in the event of the imported Grid supply being totally lost.

Generating plant as standby generation should always be considered where essential services have been identified in a project proposal / brief.

Notwithstanding the financial boundaries, due consideration should be given to other means of achieving standby or alternative supply arrangement, and a cost projection plus life cycle cost analysis carried out and submitted to the Project manager for consideration.

For embedded private generation systems, proposed to work in parallel with the National Grid supply, these should conform to Engineering Recommendations P 28, G 53 and G 59 for power quality and safety.

B.1.4 General Lighting Systems

To provide lighting that is suitable for the environment being served and anticipated tasks proposed to be conducted.

Fundamental Requirements:-

- Design to CIBSE Lighting Guide recommendations
- Equipment specified must be manufactured to British Standards.
- Reliability and efficiency of operations essential
- System must be flexible for alterations and development.

Energy efficient designs are expected as a standard, to be achieved by a dual approach in selecting efficient components and implementing efficient control measures.

B.1.5 Emergency Lighting Systems

- Designed to BS 5266 and BSEN 62034 recommendations.
- Risk assessment required to establish full coverage.
- Luminaires Manufactured to BSEN 60598 Part 2.22
- Maintained luminaire conversions to be to ICEL 1004 by ICEL registered company

- Accessibility to luminaires essential particularly in relation to working height stipulations from the HSE.
- Emergency luminaire must be aesthetically pleasing with consistent symmetrical design layout that effectively illuminates the necessary areas.

Specific Criteria	
Illumination levels on escape routes	1 lux minimum
Illumination levels on staircases	1 lux minimum
Illumination levels open areas	1 lux minimum
Illumination levels high risk areas	10% of General lighting Illuminance
Identified DDA areas	10% of General Lighting Illuminance
Duration of battery	3 hours minimum

B.1.6 Power Systems

- System design should be adequate plus allow 30% spare capacity
- System to be flexible to enable additions / omissions without major disruptions to others.
- Include measures to protect users and occupants from the possibilities of direct and indirect shock.
- Selected products to have proven reliability record.
- Proposed installation method to suit environmental requirements
- Where product selection and designs are stipulated as the responsibility of the contractor, stringent parameters must be detailed by the designer to achieve best quality.

Containment systems associated with final circuit serving small power supplied shall be suitable, durable and allowing future capacity for the proposed environment. Measures to mitigate EMF effects should be implemented in design with consideration of the proposed equipment to be installed.

B.1.7 Fire Alarms, Detection and Suppression Systems

- System must conform to BS 5839
- Stipulation of Open Protocol system including panel software is essential. See UCL's Fire Safety Technical Guides
- Design should utilise products that will facilitate reliable operation and immunity to unwanted alarms.
- Implement UCL's general policy of protection of Life.
- Equipment manufacturers to be selected from approved list and registered with the Loss Prevention Certification board.

The designer must consult in with, Local councils, London Fire & Civil Defence Authority, UCL's Fire Safety Technical Guide, and liaise with user departments where applicable when developing the design and conducting the necessary risk assessment.

Fire risk assessment can also be required by UCL property insurers as part of the strategy to safeguard valuable contents or parts of buildings. UCL's insurer's requirements should be obtained through the project manager.

In accordance with the Regulator Reform (Fire Safety) Order (-2005) the complete fire safety strategy for the building should be considered by the designer in all cases and all necessary works including such aspects as fire stopping and creating fire compartments should be allowed for. Where necessary works in this regard has been identified during the

process of design, but is outside of the scope of the project remit, these shall be brought to the attention of the College Fire Officer.

B.1.8 Mechanical Wiring

UCL's general policy is for the mechanical interconnecting and MCC wiring are allowed for in the mechanical engineering contract works. Primary electrical supplies to mechanical plant / equipment to be part of the electrical engineering designs for installation by the electrical contractor.

The Electrical Services Designer is required to carry out necessary liaising with the Mechanical Engineers associated with any given project, to establish the full extent and specific requirements to be allowed as part of the electrical tender package.

B.1.9 Lightning Protection System

Lightning protection design should be in accordance with BS EN 62305 and incorporating all necessary bonding of exposed conductive parts and other systems as detailed therein.

The designer is required to assess the necessity for lightning protection in relation to the surrounding and probability of lightning strike hitting the structure, with a bias towards safety at all times.

Consideration to be given to the aesthetic impact, reaction to dissimilar metals and practicality of accessing testing points to be paramount in the application of design.

Where alteration to and existing system is proposed the suitable clamping and coupling accessories shall be used and the system re-tested to confirm low impedance readings.
Lightning protection system components to be in accordance with BS EN 50164.

Facilities for periodic testing and inspection should be allowed in design.

B.1.10 Earthing Systems

Earthing and bonding of systems should be designed and installed to conform with the recommendation of BS 7671(as latest amendment), BS 7430, BSEN 50310, and electricity supply authority requirements.

All designs must employ as "best practice" segregation of sections of earthing system to achieve a "clean" and "dirty" system for electronic and motor loads respectively.

Allow for bonding all exposed conductive parts of the electrical installation and all such extraneous conductive parts associated with the structure as necessary.

B.2 GENERAL REQUIREMENTS

B.2.1 Decommissioning of Systems (applicable to existing buildings only)

The designer shall include specific clauses in the relevant sections of their specifications and if possible indicate on drawing decommissioning necessary for the following services.

Fire Alarms and Detection Systems
Emergency Lighting Systems
UCL's Electricity monitoring Networked meters system

Fire Alarms and Detection Systems

These shall be decommissioned by UCL's termed Maintenance contractor for Fire Alarms systems. As outlined in UCL's Fire Safety Technical Guides decommissioning should involve the conversion of the system to construction site requirements by replacing smoke detectors with heat detectors where these exist. Whilst liaising with UCL's Fire Officer the designer should conduct discussions on decommissioning works. The replacement of smoke detector with heat detectors is only considered part of the requirement necessary for mitigating the possibilities of false alarms due to construction site pollutants whilst providing some fire coverage to the site area. Methods of restricting such pollutants from circulating to other parts of a building still in occupation should be addressed at design stage with the Electrical Design Engineer taking the lead on raising this at design meetings.

Emergency Lighting Systems

Where existing central battery systems exist, critical elements such as the cabling and battery system shall not be decommissioned in an occupied building until replacement systems or alternative connection measures are in place.

For self contained emergency luminaires with traditional local controlled test key switches no special allowance for decommissioning required.

For self contained emergency luminaries complete with addressable testing modules and connected to a central addressable emergency panel, decommissioning should be carried out by the manufacturer or any termed contractor managing the system.

Designers are required to familiarise themselves with existing systems and incorporate clause(s) within the specification for the decommissioning works ensuring this does not compromise coverage for the occupied areas outside of the contract site.

UCL's Electricity monitoring Networked meters system

As a dual function of meeting Building Regulation part L and enabling better power / energy management at UCL, intelligent electricity meters are installed linked back to a head-end PC in the Estates and Facilities, Electrical Services offices via a VLAN data network.
Decommissioning of any part of this network should be discussed and agreed with UCL's Building Services Team Leader at design stage.
NO PART OF THIS SYSTEM SHOULD BE DISCONNECTED, ALTERED, ADAPTED OR REMOVED WITHOUT APPROVAL FROM THE B.S.T.L.

Design Engineers must ensure the requirement to completely strip out and remove from site all redundant equipment and wiring, or where this is not possible, clearly define the extent

of removal required. The Engineer will also be responsible for verifying this has been carried out by the contractor in a safe manner, and to UCL's satisfaction.

Waste Disposal

Design documents must stipulate that contractors should comply with the Site Waste Management Plan (SWMP) Regulations 2008. They will be required to keep this up-to-date and provide detailed breakdown of tonnage disposal of all waste from site.

B.2.2 H.V. Systems

Close liaison with the supply Authority is important to determining the correct equipment and design configuration of any works associated with H.V. systems.

In the absence of specific requirements the following guidelines should be implements as best practice designs:-

- Selected products should be suitable for the intended use and environmental conditions likely to be encountered.
- Substations to be as conventional brick structure or as Glass Reinforced Plastic housing as detailed in EDF Energy's "Building Standard for Secondary Substations and Switchrooms".
- Internal dimensions and ventilation allowances shall be sufficient for effective ambient temperature control within the substation, without the need for forced ventilation.
- Transformers should be as energy efficient as available.
- The option of Cast resin Transformers should be investigated as an alternative to standard Dry type transformers where these are a necessity to use due to weight and other factors.
- "Right of access" is required for all equipment and cabling associated with the supply authorities H.V. supply, and as such this should be allowed within any design.
- Levels of Electromagnet Interference are to be within the guidelines dictated by the National Radiological Board now covered under the Health Protection Agency.

B.2.3 Electrical Substations

To be designed in accordance with stipulation of the Distributed Network Operator.

UK Power Networks
Metropolitan House
Darks Lane
Potters Bar
EN6 1AG

…Or any other such Operator.

B.2.4 L.V. Switchgear

All switchgear is specified for Low Voltage installation to comply with all relevant standards.

Switchgear should be complete and whilst designed to maximise the circulation of air for natural ventilation measures should be taken to minimise possible contamination and

egress of dust, particles, damp and vermin. Hence IP rating should be specified in relation to the environmental conditions likely to prevail.

Switchboards / switchpanels are to be ASTA BEAB or KEMA tested and certified with regards to the protective devices and systems employed.

Instrumentation should be in accordance with IEC 51 (BS 89) with controls conforming to BS EN 60947-4-1 and BS6231.

All switchboards, control panels, Motor Control Centres, etc, to be designed / specified complete with all the necessary interconnections and switches on busbars, cables, connectors to modularise these systems such that their removal from the complete installation can be carried out with minimal disruption and continued operation of the overall system.

Complete earthing system to be incorporated on all designs with earthing points clearly identified, testing points and full earth bonding incorporated in accordance with BS 7671. (See Earthing section)

All switch panel construction shall be as Form 4 Type 2 or 5 (to be determined by UCL's Building Services Team Leader) and provided by one of the following preferred manufacturer:

A. F. Switchgear Ltd
Carville Switchgear Ltd
Schneider Electric Ltd

Existing buildings: Where modular switchboard options are not suitable, bespoke solutions must be designed particularly where space limitations and access complexities dictates.

New Buildings: Standard or bespoke panel solutions are acceptable as long as the full operational and safety criteria are met. The designer however should ensure that sufficient space is allowed by the Architect to facilitate effective equipment operation and maintenance. Ventilation should be free air assisted by the overall volume and structural design of switchrooms.

In meeting the requirements of Building regulations part L2A & B, facilities to provide metering should be incorporated within the panel design as necessary. In addition, all other outgoing ways should be equipped with CT's, "CT shorts" and voltage connection points to enable the installation of future meters as an when necessary. Meters, associated equipment and wiring shall be in accordance with UCL's requirements as detailed elsewhere.

Alternatively distribution boards or panel boards utilising Merlin Gerin NSX MCCB breakers, incorporating metering function, and should have network cabling connected to all outgoing cubicle compartments including spare cubicles.

Switchpanel requirement:-

Paint Finish :

Casework	–	powder coated finish.
Fire Systems supplies Cubicles	–	door(s) colour Poppy Red
Factory Plinth	–	As Panel Colour or Black

Fault Level Withstand – 50kA for 1 sec (unless otherwise specified).

Integrity – BS EN 60529 IP31

Form of Separation – BS EN 60439-1 Form 4 type 2 or 5

Construction

Body - 2mm(minimum) Zintec mild steel

Doors / Covers - 1.5mm(minimum) Zintec mild Steel

Glandplates - 4mm Aluminium

Access – Front and Rear

Cable Entry – Top and / or Bottom

Components :

ACBs – Merlin Gerin, or ABB.

MCCBs – Merlin Gerin, or ABB

Multimeters – Schneider ION meters (commissioned by C-Matic)

TSS – Furse or similar

C/Ts – Rayleigh / Crompton or (as approved by meter supplier)

Power Factor Correction - Eaton JSP or as Panel Manufacturer

Ref C/T - Moriarty or similar

Estimated weight – to be suitable for floor construction.

Busbar Phase Identification In Brown (L1), Black (L2) Grey (L3) and Blue (N)(Neutral)

Neutral conductors – Full size or Double Neutral as harmonic assessment requires

Insulation of Live Parts – By Barriers or Enclosure

Busbar Size– To a capacity of at least 20% greater than Design Current

Busbar Supports – sufficient regularity to eliminate mains humming.

Type Tests – The following Certificates are required

Temperature rise limits

Dielectric properties

Short-circuit strength

Continuity of protective circuit

Clearance and creepage distance

Mechanical operation

Degree of protection

Short circuit withstand strength

Factory and on site test to be witnessed by Designer and offer made to the Project manager for a UCL representative to be present.

Current Transformers shall be installed to meter manufacturer's recommendations on all incoming and outgoing ways wired to suitable terminal units with CT short links mounted on DIN rail, for both meters specified as part of the panel manufacture as well as for future additional meters.

Where necessary CT's shall be installed on Neutral bars to afford full Power quality monitoring functionality of meters that so requires this.

Electricity meters must be in accordance with UCL meter specification for UCL networked meters. Allowance must be made for the commissioning of the meter systems, constituting of a factory inspection and an on site commissioning carried out by C-Matic Systems Ltd. Meter types and network arrangement to be approved by UCL's Building Services Team Leader.

Alternative supply terminal connections should be included in switchpanel design, down stream of the supply authority's electricity meter position and including means of isolation to facilitate termination of generator or other secondary source. Controls for bringing this online should be through Castell interlocks (mechanically) and changeover switches.

Panels should be designed to enable, in as far as possible, the ability to conduct thermal imaging surveys in a safe manner.

A brief thermal image survey report should be carried out as part of the final submission once system is in operation with end user loads established.

Device Type	Breaking capacity	Number of Poles	Comments
ACB	50kA	4	Discrimination calc's and settings by designer
MCCB	18kA min	3 & 4	Discrimination calc's and settings by designer
MCB	10kA min	1, 2, & 3	Discrimination calculations by designer
Fuse	As fuse rating	N/A	Discrimination calculations by designer

Designer to ensure devices selected are sufficient to withstand a potential short circuit fault at the points of implementation.

Outgoing protective devices should be plug-in type where this is available as and option.

B.2.5 Residual Current Devices

All circuits to be fitted with RCD protection in accordance with BS7671 17th Edition, but for the exception of circuits with loads or other devices likely to cause unwanted tripping due to high leakage currents generated as part of their normal operation. Fridges, Freezers and computer s should be considered as such loads / devices. The designer much assess earth fault loop impedance in ensuring RCD operation within the respective reaction time.

Devices shall generally be incorporated within distribution boards as RCBO units or alternatively fitted local to area being served, if the nature of use means tripping is likely and resetting of devices can be managed by technical staff within the client department.

"S" – selective devices should be employed only where this is required to provide discrimination with another RCD device downstream.

The Designer is responsible for ensuring at all time the ADS (automatic disconnection of supply) times are achieved in accordance with the wiring regulations BS7671 whilst employing RCBO and MCB/RCD systems.

B.2.6 Fuses and Disconnecting Links

Fuse links should be high breaking capacity conforming to BS *88,* unless otherwise specified.

Fuse bridges and boxes should be of glazed porcelain/thermoplastic or other approved non-hygroscopic insulant construction. Disconnecting links being of hard-drawn high conductivity copper.

B.2.7 Distribution Boards

All distribution boards to comply with BS 5486 and BS EN 60439 generally as surface mounted units or where proposed as flush mounted, designed with adequate and suitable access for maintenance and rewiring.

Allowance to be made for additional earth bar to be fitted in all boards to facilitate meeting the earthing requirements of BS 7671 section 543, and / or any clean earth connections necessary.

Neutral and Earth bars must have provision for the same number of conductors as outgoing ways.

Fuseboards must be complete with cartridge fuse links of the correct rating.

MCB Distribution boards and MCCB panelboards to be appropriately sized and must be capable of have additional protection devices fitted without the need to disconnect the feed. When selecting such equipment the designer shall obtain confirmation from manufacturers of their policy to support these products for a minimum of 10 years.

Connections to the neutral bar are to be made in such a way that they correspond to the relevant phase connection.

All necessary barriers to be fitted to enable safe working and prevent the possibility of direct contact.

UCL's preference is for Schneider Merlin Gerin distribution boards where new is being specified.

B.2.8 Busbar Systems

Should be manufactured from solid drawn or laminated copper representing the 3 phase, neutral supply and earth to comply with BS EN 60439-2.

Neutral conductor to be (minimum) full size as phase conductor, and where significant harmonics is likely to be generated on the system double size neutrals to be allowed.

Tap-off busbar systems live copper conductors must be fully enclosed and suitable rated for the prospected earth fault associated with that part of the system, assessing the following conditions:-

1. short-time withstand rating
2. peak current withstand rating
3. conditional short-circuit rating when protected by a short-circuit protective device.

UCL's standardisation requires Eaton MEM Mempower busbar systems where new is being specified.

The designer is reminded of the need to assess volt drop on busbar systems, obtaining resistance and impedance values from the manufacturer as necessary.

B.2.9 Uninterruptable Power Supply units

System to comply with BS EN 50091-1, BS EN 50091-2, BS EN 62040 and BS EN 62040-3.

Static and Rotary UPS installation should be assess on the merits for the installation proposed.

Essential requirements:-

- EMC Suppression to IEC 1000 limits.
- Output voltages 380V – 415V, 3 phase at 50 HZ
- Frequency tolerance $\pm$1 %
- Power factor correction (min) 0.9
- Incorporation of full bypass system to enable extensive maintenance.
- Remote monitoring should be available as an option.

UCL's preferred supplier of UPS:-

Chloride
MGE
APC Schneider
Caterpillar / Standby Power Ltd
Piller (UK) Ltd

B.2.10 Transient Surge Suppression, Harmonic Conditioners and Pf units.

Consideration must be given to the likelihood and extent of electronic noise and their effects on the system as and incumbent part of achieving an EMC compatible system.

The designer shall consider the full building application of suppression systems where full rewiring of an existing buildings infrastructure is proposed or on new building projects.

Power factor correction units to be allowed on all new supplies.

Measures to mitigate the effects of harmonic currents to be implemented particularly in buildings employing large amounts of harmonic generating loads whilst conducting business critical operations.

B.2.11 Electricity Metering

Electricity supply meters should be installed to the specification of the metering company.

The Designer should make all the necessary arrangements with the respective meter providers for any installation requiring a new connection from the supply authority.

Information on any existing metering system can be obtained from the energy section of the Estates & Facilities Division.

Allowance should also be made for a telephone line and CAT box, to be installed for remote monitoring of this system, to the particular stipulation of the metering company, and UCL's energy section respectively.

UCL in meeting the requirements of Building Regulation part L2A is progressively installing check meters on their EMON (Electricity monitoring system) that are networked to provide power quality and energy consumption information. The designer should contact the Building Services Section for detailed information on these meters and this system.
The full specification of this system must be included in designs where check metering is to be installed. Allowance should be made for commissioning of these meters to be carried out by C-Matic Systems Ltd.

B.2.12 Earthing Systems

Safety Earthing:-
In accordance with BS 7671, providing where necessary a low ohmic impedance earth rod and full bonding of potential extraneous conductive materials and structure.

Lightning Protection Earthing:-
In accordance with BS EN 62305, providing protection of occupants, prevention of direct damage and fire, flashover or explosion due to direct lightning strike. System to also aids the dissipation of short circuit currents.

Equipment protection and functionality Earthing:-
In accordance with BS 7671, BS EN 61000, BS EN 50310 and equipment manufacturers recommendations. Earthing system must protect electronics by providing a low impedance path to interconnect equipment. Proper cable routing, zoning and shielding are important aspects of the design and have a significant purpose in preventing possible disturbance from electromagnetic and radio frequency interference.

Expert advice on earthing solutions to be obtained where necessary.

B.2.13 Power Services

Accessories for small power services shall be to BS 1363 and all other relevant standards.

Wiring of power systems as ring and radial are to be specified with suitably sized cables allowing for containment systems to maintain the physical and magnetic integrity of the circuits. RCD's to be allowed on socket outlet rings as stipulated elsewhere.

All ring socket outlets to be provide with dual earthing arrangement and wired in accordance with BS 7671 requirements for high protective conductor currents 543.7.

The designer is required to select items of equipment suitable for the environment and purposed usage or outline stringent stipulations where the selection of equipment is included as part of the contractor responsibility.

Circuit protection devices to be as new unless otherwise stipulated with full discrimination calculations carried out and where cascading protection has been designed in, settings associated with adjustable devices to be clearly stated.

Allow EMI &RF filtering as close to the point of connections for equipment to be protected where this is specified or deemed necessary.

UCL preferred supplier of accessories relating to power services is MK Electric or Legrand.

For higher rated ingress protected plug and socket disconnector unit Marechal Electrics devices are the preferred option.

Alternative power supplies in the form of battery back-up, UPS's, standby Generators, or alternative source from a different substation or H.V. ring to be given full consideration as design warrants.

Additionally the designer should assess the possibilities for using smaller UPS units, which would be installed as client managed items, local to the equipment or system being served. Where necessary designer should advise on the benefits of such as system to users work process for the PM to make and informed decision at design stage.

All circuits, both sub-mains and final, shall be complete with separate CPC.

B.2.14 Wiring Systems

Wiring should be of an approved manufacture, continuous and providing sufficient support, spare capacity, screening and earthing where necessary.

Approved systems:-

1. Conduit:
2. Trunking:
3. Cable tray, basket, ladder:

UCL prefers metal containment systems which are more durable, can be used as an earth path and provides better screening properties if installed correctly.

Domestic standard "twin and earth" cable is **not** acceptable for UCL installations.

Cableduct Ltd trunking is commonly used where dado trunking is required.

B.2.15 LV Cable Identification

Alphanumeric labels shall be fitted on conductors at all points of termination as black text printed on white background indicating (L1), (L2), (L3) and (N) stick on labels.

For single phase supplies the phase conductor should be labelled L1 or L2 or L3 and not just L as Table 51 of BS7671.

Where existing cables are to be re-terminated on a newly installed system, the individual cores shall be sleeved with the new colours, preferably heat shrinked onto the cable at the termination points, and Alphanumeric labels applied.,

Label sizes and text heights to be a sufficient to be able to identify cables without exposure to live parts.

All other labelling in accordance with BS7671 should be applied as necessary.

B.2.16 Cable Types & Colours

Apart form the colour identifications outlined above the following colour assignments shall apply to all installations within the college.

System	*Cable type*	*Colour*
Voice & Data	UTP structured Cat 5e – 6	Orange (old grey)
Voice PSTN	BT spec cable	White
Addressable Emergency lighting comms network	Screened or Unscreened Twisted pair Belden	Green
Lighting control bus	To system manufacturers specification	Yellow
Fire Alarms systems	Pirelli FP 200Gold, FP200 Plus, Pyrotenax MICC	Red
Fire Communication (for critical data communications)	Pyrotenax Pyro TwistE	Red
Induction loop cable	As Specialist Spec.	Blue

B.2.17 Lighting

Lighting luminaires to conform to BS EN 60598.

CIBSE lighting Guide recommendations should be employed for obtaining a good standard of design.

Designs should also conform as far as they are applicable to the following Guidance and Limitations:-

1. Building Regulations (Part L2A)
2. BRE (BREEAM)
3. SLL (Society of Light and Lighting) CIBSE Code for Lighting.

4. BS EN 12464-1
5. The Disability Discrimination Act.

Designers should be aware of imminent industrial changes to the recommendations and standards and where prudent allow for such changes within their design.
Illuminance shall be to those recommended in the CIBSE lighting code where not otherwise stated below:

Illuminance (Lux) Levels

Room / Area / Facility	***Lux***	***Colour Rendering***	***Notes***
Entrance Halls & Circulating areas	200	Ra 70-90	Aesthetic general lighting should be complemented with feature lighting where possible.
Reception Desk	500	Ra 80-89	Localised / Directional lighting
Rest Room	150	Ra 70-80	Wall lights to be considered in addition to ceiling system where possible.
Toilets	150	Ra 70-80	Wall lights to be considered in addition to ceiling system where possible.
Disabled Toilets	250	Ra 70-80	Apply best practice for DDA environment.
Kitchens	500	Ra 80-89	Recommeded figure is general illuminance. Task lighting to be allowed where necessary
Refectory / Canteens	300	Ra 60-79	General Array lighting unless otherwise specified.
Plantrooms	200	Ra 60-69	Luminaire to be positioned to suit equipment layout and to best illuminate areas where maintenance will be carried out.
Electrical Switchrooms	250	Ra 60-79	Luminaire to be positioned to suit equipment layout and to best illuminate areas where maintenance will be carried out.
Office areas	400	Ra 80-89	Recommeded illuminance to be achieved by general lighting array. Output regulating ballats to be used where possible for flexibility and energy efficiency. User must be capable of adjusting lighting level from user interface control in addition to the ON
Computer Cluster rooms	300	Ra 80-89	To the recommedations of LG3, implementing Inteligent lighting control monitoring occupancy.
Library Areas	300-400	Ra >90	Good vertical illumination required. Workplanes should be vertical for book rack areas and horizontal for write-up spaces. Precise lighting control required where energy saving lighting control measures are incorporated.
Laboratories	500	Ra >90	Regulating ballats to be considered where these will not affect working conditions. Occupancy and daylight sensors to be employed for energy efficiency.
Workshops	500	Ra >90	Manual control but with presence control on lights over corridor or walkway areas where possible.

Lighting solutions should ensure that illumination is considered not just on the horizontal working plain but also effective vertical illumination of the space and ensuring uniformity utilising spacing to height ratio figures provided by manufacturers.
UCL recommended lighting suppliers:-

RIDI Ltd
Luxonic Ltd
Zumtobel
Thorn Lighting
Hacel Lighting
Thorlux Lighting
Cooper Lighting
Concord
Siteco Ltd
ETAP
Glamox Luxo
Faguhault
Philips Lighting
Photonstar

Sample luminaires will be required by project team for inspection before final approval of any manufacturer's product.

LED Luminaires

In employing LED lighting products as part of the general lighting solutions, UCL recognises the vast array of inferior quality products are in the market.
Hence LED lighting products engines must be constructed as SMD (Surface Mounted Devices) or COB (Chip on Board Devices). THD (Through Hole Devices) are not acceptable and should not be specified.
Where LED products are being proposed for general lighting solutions, the designer should primarily consider products where the luminaire construction is such that the LED light engines can be removed without removing the complete luminaire.
Luminaire products must employ Philips or Cree LED light engines.
The designer is required to satisfy his/herself with the "binning" approach of the manufacturer, and their approach to future replacements, will provide considering consistent colour rendering of same specification products.
LED luminaires, where possible, should be employed for applications where supplementary decorative lighting or other purpose lighting (such as museums and gallery artefacts display lighting). The designer is required to carry out necessary lighting design calculations, obtaining photometric data from manufacturers as necessary. The low energy consumption properties of LED products makes them an attractive option; but the designer must ensure the products selected are practical, robust, easily replaceable and achieves the light levels required. Allowance must always be made for the possibility of premature failure of these products, ensuring access and a maintainable solution is part of the design.

LED lighting products should be considered for external lighting proposals.

For maintenance factor assessment the designer should apply a 3 year duration between luminaire cleaning.

B.2.18 Lamps Colour Temperature Guide

Lamps should in the first instant afford suitable lumens output, efficient consumption and maximum life expectancy.

In the absence of specific requirements in the project brief the following should apply.

Areas	Colour Temp
Corridors *General circulating &* *Toilets* *Plantroom*	*3500 k (white)*
Offices *Write-up areas* *Computer Cluster Rooms*	*3500 k (White)*
Laboratories *Workshops* *Libraries*	*4000 k (Cool White)*
Where specified & *BSU*	*6000k (Daylight)*

B.2.19 Lamps and Ballast preference

All fluorescence luminaires shall employ high frequency ballasts controllers.

For linear fluorescent luminaires where possible T5 lamps should be specified with Multi-Watt control Ballast. UCL's preferred ballast manufacturer is Tridonic who's units affords flexibility of control systems possible.

Digital dimmable ballasts as Tridonic Eco and Excel (one for all) provides simple solution to providing dimming without separate dimmable control gear and where tied in with automated control systems offers energy efficiency control.

Compact fluorescent luminaires preferences:-

TCL, circular T5 and 2D lamps
Opal or Polycarbonate diffuser
Good flashing.

Where more than one TCL lamp is used failure of one should not compromise operation of the other.

Multi-Watt ballast where possible.

Low Voltage halogen spot lights should be avoided where possible due to their high maintenance requirement.

B.2.20 Lighting Control Systems

Control of lighting should enable user interface as well as provide energy conservation in relation to daylight contribution and occupancy. It is strongly recommended that design proposals for automated controls are approved by lighting controls specialist to ensure complete coverage and reliable operation.

Control Systems should:

- Be operating on digital control protocols such as DSI or DALI
- Incorporating bus cabling and driver devices, linking all lighting control devises.
- Employs microwave sensors for more reliable detection where this is possible.
- Implement Corridor linking and Daylight sensing.
- Utilise digitally dimmable control gear in luminaires to regulate light output and maximise energy efficiency.

User interface must be allowed, either in the form of remote handheld devices or wall mounted switches compatible with the system.

Record information of the lighting control system should be included on drawings, and shall consist of Addresses, Zonal information, device locations, cable routes and an indication of the control strategy.

Digital DSI and Dali lighting protocols now provides a common platform for system to be developed around employing intelligent control ballasts with individual addressability and should be utilised where possible on designs.

UCL standardises on distributed intelligence systems of the following manufacturers:-

Ex-Or Lighting Ltd - MLS system
Thorn Lighting – Sensa link.

B.2.21 Specialist Lighting

All lighting designs associated with the floodlighting of buildings, Theatre lighting of stage areas, and feature lighting of moving objects or water features should be referred to a lighting specialist with proven track record.

Photographic Darkrooms should be fitted with tungsten halogen or GLS lamp luminaires for general lighting to eliminate possible afterglow issues commonly associated with discharge lamps.

Emergency Lighting

UCL's buildings are served by emergency lighting in accordance with BS 5266 and BSEN 62034.

UCL's policy of emergency lighting:-

Non-maintained luminaires shall be installed as standalone 3 hour duration units obtaining live feed from the local associated lighting circuit, but for the following exceptional conditions:
Areas with high ceilings and where wall mounted emergency lights would not meet the requirements.
Aesthetically pleasing areas where a standalone emergency light would compromise the effect of the space.
Where space restrictions dictates.
In listed buildings retaining a certain period feel.

Emergency units to be incorporated within luminaire or remote mounted only on luminaires that are mounted in accessible suspended ceilings.

LED versions of emergency lights should be employed wherever possible, as alternatives to the normal fluorescent units providing the required lighting levels are achieved. UCL would however, still require LED solutions to be compatible with the testing system being employed throughout the building.

B.2.22 Emergency Lighting Testing Systems

Testing systems shall be in accordance with BS 5266 as a manual test key switch system (preferably ganged with the local light switch control or located at the distribution board positions), where an automated addressable testing system neither exists nor is proposed as part of the project specific brief.

Addressable testing system shall be as a UCL approved system installed fully to the manufacturer's recommendation and in accordance with UCL's policy:-

Emergency Lighting Addressable System
Addressable emergency lighting testing systems has been installed in a number of buildings and the policy is to extend the coverage where possible.

Where systems do not exist the BSTL shall determine the requirement for the project.

Where a system exists the designer should allow for their adaptation for the new proposals, and should liaise with the system manufacturer to develop the design and work elements.

Currently the Addressable lighting system implemented at UCL are supplied by:-

Advanced Electronics Ltd.
Morley House
West Chirton
North Shields
Tyne & Wear
NE29 7TY
Tel : 0191 257 6361
Fax: 0191 257 6373

Or

Thorn Explorer Vision product
Thorn Lighting ltd
Silver Screens,
Elstree Way
Borehamwood
Herts
WD6 1FE
Tel: 020 8732 9800
Fax: 020 8732 9801

In all cases where works are carried out on the system, commissioning back to head end PC on the main site is required, with handover constituting :-

A fault free 3 hour duration test on system (and printout where necessary).
CD with set-up and back-up files of the system as commissioned.
Commissioning Certificates and Random Check list.
Record information should include drawings with addresses, device numbers, and or group numbers; indication of routes of communication cabling plus other associated equipment.

The employment of either of these systems will be based on the guidance of UCL's Engineers with only one of these systems being installed within any given building. The designer must liaise with the Building Services Team Leader for final confirmation on system to be installed on each project.

The designer shall also allow for the installation of data socket adjacent to the control panel of these systems and advise the PM or BSTL of the port numbers to enable UCL to arrange configuration of the IT network, for secure communication to the remote PC.

B.2.23 Fire Alarms and Detection System

Designs to comply with:-

- BS 5839,
- CIBSE TM16,
- CIBSE Fire Engineering Guide E,
- UCL's Fire Technical Guides (from Fire Safety Advice website or Fire Officer),
- UCL insurance requirements,
- BS 6266 Code of protection for electronic equipment installations
- BS 7273-1 Extinguishing systems

UCL's policy is generally to protect Life (Category group L).

However not all systems will fit neatly into the different recommended categories for an entire building and as such for higher risk rooms and property protection must be assessed and allowed for as necessary.
Implement property protection policy where stipulated or where value of equipment within area or associated with facility is £500,000 or more.

The specification should cover:

- Type and location of detectors, sounders, control panels, keypads and power supplies.
- Cable type and method of installation.
- Alarm signalling.
- Telecommunications / reporting function.

- Connection of ancillary services.
- Smoke extract systems.
- Fireman's switches.
- Warning and evacuation signs
- Other Ancillary services connections
- Override switch on fire alarm panel to isolate plant, gas valves, fire dangers etc. during testing.
- Facilities for DDA alerting and evacuation.

Loads of loops and sounder circuits must be sized to ensure fault free operation so that protective devices are not blown or tripped during Fire Alarm activation.

All systems should be zoned, including on Addressable systems, and cable routes indicated.

In the event that the design proposal constitutes a deviation from British Standards recommendations this should be agreed with UCL's Fire Officer and all relevant interested parties, ensuring this is fully documented on commissioning certificate.

UCL's policy employs Apollo protocol devices and open protocol panels in accordance with UCL's Fire Safety Technical Guides.

Preferential panel manufacturer Morley IAS.

Fire Alarms Ancillary Systems
Allowance should be made for the integration of the following other services to the fire alarms system:-

- DDA systems (such as Disabled pager panel)
- Sprinkler systems
- Door closers / door hold–open devices.
- Fire fighting services
- Passenger Lifts and Mechanical control panels.

Note: The interfacing of the above systems should not compromise the reliability and functionality of the Fire Alarms and detection system.

All designs must be approved by UCL's Fire Officer

UCL has a 24 hour 365 days of the year Communication centre which monitors all alarm signals. The designer should liaise with the Comms Room manager (Paul Hayden) with regards to requirements for linking the system to this monitoring station.

Cabling should be specified as enhanced type cables.

B.2.24 Disabled Alarms & Services

In meeting the Disability Discrimination Act requirements the following should be considered during design and allowed for where feasible:-

1. Electrical supplies to disabled lifting systems.
2. Increase illumination levels in circulating areas
3. Mounting heights of accessories in accordance with DDA legislation.
4. Access facilities including allowing for door hold open devices where necessary.
5. Egress facilities via evacuation lift for persons with mobility problems.
6. Services for Refuge Areas
7. Induction loops for general circulating areas and office.
8. Disabled pager alarms system integrated to BS 7807.
9. Flashing xenon light on alarm circuit of fire alarms.
10. Disable call systems in toilets and other areas as necessary.
11. Panic alarms
12. Induction loops of sound field systems for Lecture Theatres and Seminar rooms.

Induction Loops
Audio Frequency Induction Loop Systems (AFILS) must be designed and installed to conform to BS 7594 BS 6083 IEC 118 Part 4.

A conformance certificate must be issued on completion, clearly stating the dB level of the AFILS and any adverse characteristics of the installed system.

Where Disable pager panel is to be installed on a Fire Alarm System both the power supply and signal link must be monitored.

For systems that require linking back to the Comms Room monitoring station a normally closed volt free pair relay should be allowed on the control panel.
Liaise with Paul Hayden for wiring and point of interfacing information.

B.2.25 Ancillary Alarms

Other alarms systems can generally constitute Safety monitoring systems where hazards exits and Freezer Alarms for status monitoring.

Systems proposed are to be approved by UCL's Senior Engineers.

Communication link back to comms room requires NC volt free relay. Liaise with Paul Hayden on wiring and point of interfacing information.

B.2.26 Intruder & Panic Alarms

System design to conform to all latest relevant standards.

Installing companies should be NACOSS or SSAIB approved.

Liaise with Nick Kyriacou and Paul Hayden on proposed designs and interfacing system with Comms Room respectively.

B.2.27 Access & CCTV Security Systems

System design to conform to all latest relevant standards and UCL's *"Specification for the Installation of turnstiles and their integration with UCL's Cardax access control system"*.

Liaise with Mike Dawe and Paul Hayden for information on system design and interfacing system with Comms Room.

B.2.28 Communication Systems

In accordance with all relevant Standards as outline in UCL's Standard Specifications for IT Voice and Data networks Installations from Nigel Hayward.

B.2.29 Media Systems

This generally relates to Audio Visual systems design brief for which should be obtained from UCL's Audio Visual Department through the Project Manager. All design proposals should be submitted back to the said department for final approval.

B.2.30 Labelling of Services

Labelling for Distribution System:
Shall be carried out with engraved traffolite Black on White, fixed with plastic rivets of nylon screws.

MAIN SWITCHPANEL: (5mm lettering)		
Fields	**Details**	**Explanation**
Ref:	***UCL PANEL A***	*This should be the main switchpanel ref.*
Fed from:	***Somewhere Switchroom "MP2-7"***	*Details of where the supply emanates from (item in quotation is the cubicle ref if applicable)*
Service Rating:	***400A***	*Maximum current rating of the supply.*
Protection Type:	***MCCB***	*Up-stream protection device*
Incoming Cable:	***240mm/XLPE/SWA/LSF + CPC***	*Self explanatory (should include size of CPC)*

OUT GOING DEVICES CUBICLES: (5mm lettering)		
Fields	**Details**	**Explanation**
Ref:	***Panel A/4***	*This should be the particular switch cubicle reference (example adjacent Panel A/4 representing Panel A cubicle # 4)*
Serving		*Reference and or description of equip / DB being served.*
Location		*Location of equipment or distribution board being served.*
Max Device Rating:		*Self explanatory*
Device Setting		*Applies to MCCB devices that allows for adjustment of "In" protection level*
Cable Size / Type:		*Self explanatory (always indicated cpc where installed)*
Device Type:		*Manufacturer and order Ref:*

Note: spare cubicles to be labelled with Ref and other fields blank.

For field sub-mains and final distribution boards. (5mm lettering)

Fields	**Details**	**explanation**
Ref:	***Gnd/DB1***	*Identity of distribution board (either obtained from Estates or as per design drawings)*
Serving	***Ground floor lighting and power.***	*Reference and or description of equip / DB or services being supplied.*
Fed From	***Tap off on Rising busbar.***	*Equipment / system serving this unit.*
Cable Size / Type:		*Self explanatory*

For field Switch/fuse, Fuse/switch and Isolators. (3mm lettering)

Fields	**Details**	**explanation**
Ref:	***DB1/ Cir4***	*Identity of circuit (taken from upstream DB circuit way)*
Serving	***Any Equipment.***	*Reference and or description of equip or services being supplied.*
Fed From	***Some DB***	*Equipment / system serving this unit.*

Tap-off boxes to have ref. identification only.

Cables shall be labelled with the following information (3mm lettering)

Fields	Details	explanation
Serving		*Reference and or description of equip / DB being served.*
Location		*Location of equipment or distribution board being fed.*
Cable Size / Type:		*Self explanatory*

Other systems to be labelled :-

- **All socket outlets and power disconnectors – labelled with circuit ref.**
- **All conductors in distribution boards, MCC etc. to be labelled with termination ref.**
- **All fire alarms equipment with necessary addresses and zones.**
- **All emergency lighting addressable luminaires with addresses etc.**
- **All emergency luminaires identifying them as emergency lights.**
- **Any other control / monitoring system that required peripheral connections to be identified.**

These labels can be of a stick on type to be approved by UCL.

MECHANICAL SERVICES
SECTION C - CONTENT

C.1 Design Criteria

C.1.1 Environmental criteria, External Conditions

Summer (General)	30 C dry bulb 20.5C wet bulb
Summer (BSU areas)	32 C dry bulb 22.5C wet bulb
Winter (General)	-3 C dry bulb saturated
Winter (BSU areas)	-5 C dry bulb saturated

Frost coils on air handling plant designed to operate overnight and weekends shall be sized to provide frost protection and meet design with ambient external temp of –5C; and protect plant from freezing down to –8C.

Heat rejection plant to be selected to achieve design at 32 dry bulb temperature but shall continue to operate satisfactorily with an ambient dry bulb temperature of 38C.

C.1.2 Environmental Criteria, Internal Conditions

Teaching and Research Laboratories, Support Areas, offices etc.

Winter …… 20C dry bulb min RH uncontrolled.

Summer (when cooling is specified)…… 26C dry bulb max RH uncontrolled (unless demanded by a process)

BSU Areas …… 55% RH ± 10%

Each holding room shall be capable of being held at any set point between …….. 19-23C ± 2C unless directed otherwise by User Department on room data sheets.

Lecture Theatres …… .. Winter 21C dry bulb ± 2C within occupied zone RH 30% minimum Summer 24°C dry bulb ± 2c within occupied zone.

Seminar & Tutorial Rooms…… Winter 20C dry bulb minimum

Summer 24 c dry bulb max (where cooling is specified) RH uncontrolled.

Stairs & other circulation …… Winter 18C dry bulb minimum spaces.

C.1.3 Ventilation Requirements

Teaching & Research Labs…… Rate to be determined by assessment of required dilution or containment with increased levels of ventilation where dictated by high density of fume cupboards or special extracts

BSU Areas …….. 20 air changes per hour min with increased rates to suit heat gain if necessary.

Lecture Theatres ……10 l/s per person (no smoking)

Seminar/Tutorial Rooms ……10 l/s per person where cooling is provided with increased rates as appropriate where not cooled.

Toilets ……10 air changes per hour extract, 8 air changes per hour make up (where appropriate to provide make-up air).

Shower rooms …… 15 air changes per hour or an extract rate of 30 l/s per shower whichever is the greater.

Offices …….. 10 l/s per person where cooling is provided (subject to a minimum 3 air changes per hour or 24 l/s per office) with increased rates as appropriate where not cooled .

C.1.4 Filtration Standards

Teaching and Research Laboratory …… EU3 pre-filters with EU8 bag filter with increased levels where dictated by special facilities.

All other areas ……EU3 pre-filters with EU6 bag filters.

C.1.5 Internal Heat Loads

In addition to the solar, lighting, and heat loads from occupants, the air conditioning/cooling systems to be designed to offset the loads from equipment and computers, derived for room data sheets. Should the stated equipment gains result in an exceptionally high load expressed in terms of watts per metre squared then this shall discussed with Estates and Facilities to decide if a diversity or similar reducing assessment is appropriate.

C.1.6 Water Services

i) Cold Water Storage

Laboratories (category 5 water)…… to be assessed from room data sheets and discussions with users.

Domestic (category 1 water)……..45 l/person Lab staff 20 l/person Students

ii) Hot water Storage

Domestic (category 2 water) …… 4.5 1/person

Laboratories (category 5 water)…… to be assessed from room data sheets and discussions with users.

*C.1.7 **Noise criteria***

Internal noise levels

Type of Accommodation	Sound Level Range (NR)
Lecture Theatres	20-25
Seminar Rooms	25-35
Laboratory (Without fume cupboards)	30-40
Laboratory (With fume cupboards)	40-50
Toilets	35-45
Showers	35-45
Print Room	35-45
Research Write-Up	30-35
Tissue Culture	35-45

BSU to comply with Home Office Code of Practice.

*C.1.8 **External noise criteria***

This will generally be determined by Local Authority requirements. (e.g. L.B. Camden are currently requesting that new plant be 10dB(A) less than existing background noise levels to ensure that the net result is no increase in noise level).

C2 GENERAL REQUIREMENTS

C.2.1 Heating

UCL has a combined heat and power (CHP) system serving the majority of buildings on the Gower Street campus. New buildings or refurbishment projects on this campus shall generally be connected to this heat source. Projects outside the main campus shall be provided with heating appropriate to the scheme.

New buildings on the main campus will need to finance a connection charge to the district heating mains to cover the cost to provide a plate heat exchanger (PHE) with primary controls. The project works would commence on the secondary side of the PHE. Where refurbishment works require a new source of heating, connections shall be made to the existing secondary side of the PHE.

Systems must be designed to keep the secondary return temperature to the PHE below 70C to ensure maximum efficiency of heat recovery from, and cooling of, the CHP engines and to avoid the need for waste heat rejection. Heat rejection is provided via air blast coolers on the roof of the DMS Watson Building for when there is little or no heat load on the system. The primary district heating is designed to maintain 80C on the secondary flow when heating is required. This results in the following design criteria being generally adopted:

- LPHW to be designed for 80C flow and 65C return.
- Maintain a minimum flow through the PHE so that the immersion sensor in the secondary flow will record a true temperature (if designing a total variable temperature system then this should include a constant volume loop with mixing valve set to control on the return temperature to the PHE. Details to be discussed with Estates and Facilities engineers).
- Provide a volt free signal pair to the primary control panel to indicate that heating is or is no longer required (e.g. to coincide with optimum on/off)
- Avoid the use of 3-port diverting valves which would divert water at flow temperature back to the return in low load conditions. Utilise 2 port control valves and variable volume pumps taking due regard of minimum flow requirements of the pumps.

Heat emitters within disabled toilets or similar areas shall be of the low surface temperature type.

C.2.2 Cold Water Services

Systems shall be designed in accordance with the Water Regulations 1999 and CIBSE TM13 and HSG guidance L8.

Thames Water have instigated a programme to reduce the pressure in their mains to reduce leakage rates. They are bound to provide only 1 bar gauge pressure at the main and may progressively reduce to this minimum. Projects involving provision of new storage systems and substantial mains water distribution shall therefore be designed with booster sets.

Water consumption can be less than that indicated by design guides and interpretation of occupancy levels from room data sheets, leading to hygiene risks due to low turnover of stored water. Water cisterns shall be sized in the normal way but fitted with Aylesbury "KB" type delayed action float valves with adjustable water and differential levels. The levels shall initially be set at lower than the listed actual capacity of the cisterns and shall be adjusted to suit actual turnover under "in-use" conditions.

In new buildings the cold water storage for laboratory and for domestic use shall be totally segregated in accordance with the water categories.

In existing buildings the extent of the segregation shall be discussed with the Building Services section of the Estates and Facilities Division to agree what can be reasonably achieved within the cost restraints of the project. The minimum requirement shall be to segregate the water services in the new project area even though these might be connected to a common point outside the project area. This will provide a ready point of connection when services to the remainder of the building are brought into line with the regulations.

Although the risk assessments for a particular project may identify laboratory use water as category 4, all laboratory use water (except wash basins in laboratories) shall be designed as category 5. The reasons for this are:

- RPZ valves are not generally acceptable due to the costs to maintain these on a register and the ongoing maintenance liability.
- Laboratory use can change within a short time and flexibility of use is required.

The wash basin provided in a laboratory for use at point of exit shall be served with category 1 domestic water. If eye-wash points are specified then these shall also be served with category 1 domestic water.

Category 5 water supplies shall generally be boosted.

Water purifiers shall be served by category 5 water.

Where extending from existing CWS circulation pipework, the new pipework shall be of the same material as existing to avoid dezincification. However, the aim is not to install new galvanised steel pipework in UCL buildings and plastics materials shall be considered in this instance. The approved plastics material is Friatherm PVCc by Durapipe and alternatives will not be considered unless they are interchangeable with Friatherm tubes and fittings. New systems shall be in table X copper tubes with non-dezincifiable fittings.

Stainless steel braided EDPD (or similar) flexible hoses shall not be used for final connections to outlets. Corrugated copper flexible connectors are an acceptable alternative,

Services shall be labelled "cat 1 water" or "cat 5 water"

C.2.3 Hot Water Services

Systems shall be designed in accordance with the Water Regulations 1999 and CIBSE TM13 and HSC guidance L8.

On the main campus primary hot water for category 2 domestic use shall generally be provided by a new PHE, connected to the CHP district heating subject to a connection charge, or connection to the secondary side of an existing PHE, as described for the heating. Projects outside the main campus shall be provided with HWS appropriate to the scheme.

If considering utilising the secondary LPHW from a PHE as primaries to HWS cylinders then 2 port control of the primary HWS shall be employed. However, consideration shall be given to the fact that in summer conditions the very low primary flow to maintain HWS temperatures through a large combined PHE may result in the primary heat meter being unacceptably inaccurate dependant on the turn-down ratio. Further, if the requirement to keep the return temperature to the PHE below 70C is designed to be achieved by an injection system then this could result in the heating flow temperature being below that required for pasteurisation in low heating load conditions.

User Departments shall be consulted to establish the minimum number of hot water outlets required in a laboratory, as a hot supply is not always required to a laboratory sink. The laboratory hot water for small projects can be served by local electric water heaters connected to the category 5 boosted cold water, unless there is an existing category 5 HWS system available for connection. Where a larger number of laboratory outlets justifies the requirement for central category 5 HWS plant, then this shall be totally segregated from the category 2 supplies with separate secondary cold feeds and circulation pipework.

The wash basin provided in a laboratory for use at point of exit shall be served with category 2 domestic water.

Hot water to washbasins in disabled toilets or general public/student use areas shall be provided with point of use blending valves limiting the temperature to 43C at the outlet. Hot water supplies to laboratories and staff accommodation are not considered "public" areas and do not require this control.

Where extending from existing HWS circulation pipework, the new pipework shall be of the same material as existing to avoid dezincification. However, the aim is not to install new galvanised steel pipework in UCL buildings and plastics materials shall be considered in this instance. The approved plastics material is Friatherm PVCc by Durapipe and alternatives will not be considered unless they are interchangeable with Friatherm tubes and fittings. New systems shall be in table X copper tubes with non-dezincifiable fittings.

Stainless steel braided EDPD (or similar) flexible hoses shall not be used for final connections to outlets. Corrugated copper flexible connectors are an acceptable alternative,

Deadlegs shall be avoided where control sensors or thermometers etc are installed. Pressure sensors shall be used to control/monitor HWS pumps. (Differential pressure switches shall not be installed across pumps as the related capillary pipes form deadlegs).

Services shall be labelled "cat 2 water" or "cat 5 water"

C.2.4 Chilled Water

Where extending from existing chilled water circulation the use of ABS plastic or Geberit "Mapress" stainless steel pipework shall be specified to reduce the risk of interaction between dissimilar metal materials. Imperial size ABS tube (class E up to 50mm and class C above 50mm) shall be specified as this has higher rating than the metric size range. Where adapting from screwed fittings to plastic, male threaded plastic fittings shall be used. Female threaded plastic fittings shall NOT be used as these have been found to readily split when the joint is tightened. Durapipe Superflow thinwall ABS SHALL NOT BE USED. Where separate new plant and pipework is provided then ABS, stainless steel, or copper shall be used as appropriate.

C.2.5 Expansion and Contraction

Provision for expansion and contraction of pipe services shall be designed and detailed on the tender drawings rather than covered by a general clause in the specification.

C.2.6 Isolating Valves

Isolation valves shall be detailed at main pipework junctions and at all branches from risers to enable future adaptations without the need to isolate large areas of a building.

C.2.7 Equipment Cooling

Where scientific equipment requires process cooling then this shall be provided by closed circuit systems incorporating a chiller (or a plate heat exchanger if central chiller plant is available). Buffer vessels shall be incorporated to provide stable temperatures. Where removal of residual heat from equipment is required in the event of electrical or chiller failure then an automatic, standby, water to waste, system utilising normally open and normally closed solenoid valves shall be considered after discussion with Estates and Facilities engineers.

User Departments shall be consulted to obtain installation requirement data for the equipment to establish:

- heat gain
- min/max water pressures
- tolerance to back pressure (e.g. some electron microscopes will not operate if the outlet back-pressure/static lift exceeds approx 3 metres head.)
- flow rate
- whether tap water or treated water fill is required (e.g. de-ionised water may require special components)
- the required cooling water flow temperature to avoid condensation
- whether there is a requirement for removal of residual heat from equipment in the event of electrical or chiller failure.

C.2.8 Mechanical Ventilation

Within laboratories mechanical ventilation shall be designed as a full fresh air system with heat recovery where appropriate (e.g. heat recovery from fume cupboard and safety cabinet exhausts is not considered appropriate). Thermal wheels and cross flow plate heat exchangers are preferred to heat pipes and run-around coils.

LPHW heating coils shall be provided rather than electric heating except in exceptional circumstances (e.g. standby heating for BSU's).

Frost coils shall have wide spaced fins to minimise fouling.

In areas other than BSU's control of humidity shall normally be only provided if specifically requested.

Supply air diffusers shall be designed and located to minimise air movement at the face of fume cupboards and microbiological safety cabinets which would otherwise have an adverse effect on containment.

Laboratories shall generally be designed to operate at negative pressure (i.e. greater extract than supply) for containment. Where there is a specific requirement to design a laboratory for positive pressure for cleanliness then this shall be referred to Estates and Facilities for approval. If this is accepted then a lobby shall be incorporated to provide containment and to prevent spread of smoke and fire to corridors and means of escape.

Generally all mechanically ventilated areas shall be designed to operate at negative pressure to prevent spread of smoke and fire to corridors and means of escape.

Supply/make-up air systems for local exhaust systems (fume cupboards etc.) shall be controlled such that this is isolated when the local exhaust system is off to avoid pressurising the room. Where appropriate, systems shall include constant volume devices to maintain the system balance when interlocked make-up air supply branches are isolated.

All air handling systems shall be fitted with a full set of clean filters and provided with a full set of new spare filters at handover. The O&M manuals shall contain a separate sheet listing the number, size, and type of all filters so that this information can be readily accessed to update the master schedule for the Campus.

C.2.9 Cooling Towers and Dry Coolers

Air blast and adiabatic air blast coolers shall be employed where practical but, subject to consultation with the Estates and Facilities Division, Cooling towers can be considered.

C.2.10 Biological Services Units (BSU's)

Systems for holding rooms and other such licensed areas shall comply with the current code of practice for the Housing and Care of Animals used in Scientific Procedures published by HMSO.

Design for a minimum of 20 ach in holding rooms and increase as necessary where required due to high heat gains.

Maintaining the ventilation to these areas is critical and where stand-by power generation is available the AHU's shall be arranged to operate in the event of mains power failure. This requirement would not generally extend to the associated chiller plant due to the high power demand of such plant but the User Department should be consulted. The AHU's shall be provided with duplicate components to maintain the ventilation but this need not necessarily mean duplicate 100% duty plant but could be designed to maintain say 66% duty on failure of one component. Boilers and chillers shall comprise modular components and duplicate pumps etc shall be provided to maintain reasonable conditions in the event of failure of one item of plant.

Terminal reheat designs are preferred for good humidity and temperature control. Hot and cold dual duct systems are not generally acceptable.

Humidifiers shall be of the steam generation type and gas-fired units shall be considered as well as electric units.

BSU installations shall be controlled by a Building Energy Management System (BEMS) linked to the various supervisor terminals on the main campus. Additionally, the BSU shall be provided with a supervisor terminal for management by the Users, but this shall have access limited to the particular BSU only. The controls shall be configured to log temperature and humidity in each licensed room, and to relay critical environmental alarms to UCL's permanently manned communications room. (Consult User Department to define which alarms and at what set points it is appropriate to activate these alarms to summon "out-of-hours" attendance).

C.2.11 Controls

Unless projects are of a minor nature then installations shall be controlled by a Building Energy Management System (BEMS) linked to the various supervisor terminals on the main campus.

BEMS (hard wired LAN communication)

A number of existing systems at UCL employ the Satchwell BAS2800+ system and no further outstations shall be added to these systems.

BEMS (Data network communication)

UCL has established the infrastructure to operate the Trend IQ3XCITE and the Satchwell Sigma BEMS and these systems should now be employed as standard. These systems utilise ethernet data communications. UCL has set up a virtual LAN (VLAN) within our intranet data network for each of these systems.

It is intended that both systems be considered and possibly specified for final selection by contractors based on competition of both price and performance. However, there may be occasions when only one of these systems would be selected based upon building area consistency or other operational requirement. UCL Estates and Facilities Division shall be consulted to discuss the selection.

Where packaged plant manufacturers (chillers, AHU's, fan coils etc) have developed full interface controls to Trend/Satchwell these shall be used in preference to plant that requires interfaces to "talk" to other control protocols such as LON-works. Provide full control functionality between such packaged plant interface controllers (not just on/off/common alarm functions)

Provide interactive graphics for each control loop, item of plant etc with knobs and switches to fix an output to a set value; manually over-ride on/off and auto changeover control; amend timeschedules; reset software latches. Graphic format shall be as current UCL systems and controls specialists shall be instructed to contact UCL Estates and Facilities to arrange to view current graphics.

Configure logs on all points to provide 3 days history to assist trouble shooting.

Programme three levels of alarms and liaise with UCL Estates and Facilities regarding routing and whether routing shall be timeschedule dependant. Programme passwords and access levels on UCL supervisor terminal as directed by UCL Estates and Facilities but generally as follows:

1. Critical - Any alarm which would be connected to the UCL Krone system and reported to the Communications room (manned 24/7). This could be time dependant i.e. Sump pump failure could be high level alarm in normal hours but critical outside normal hours.

2. High Level - Other building/system specific alarms i.e. Water flow, boiler flow, air flow failure, single pump set, pressure set, single boiler and 2nd level DHW alarms.

3. Low Level - Local failure, single pump on twin set, single boiler in multi boiler installation.

Set up web pages on integral web servers of controller for access to interactive graphics via Internet Explorer from a remote PC.

Provide strategy diagrams in paper copy in O&M manuals and on CD in electronic format for record purposes and future adaptions.

Areas such as lecture theatres and seminar rooms subject to intermittent use shall incorporate a form of occupancy control for energy efficiency. This shall generally be in the form of a time-schedule to operate the plant for a minimum period to pre-condition the space and occupancy sensors to switch the plant to full speed.

Control panels shall incorporate fire alarm circuit interlock relays and lamp test buttons. Provide relays to selector switches to give a common alarm to the BEMS when one or more

panel selector switches are in "hand". Provide switched socket outlet on side of panel. Panels shall be in standard grey finish. Panels shall generally be form 2 (separate power and control section) with MCB's (type D where appropriate), and 15% spare backspace for expansion. Critchley type ferrule markers shall be used to identify all terminations in the control panel and at plant and equipment in the field.

Controllers, detectors, actuators, valves and all associated control equipment shall be by Trend or Satchwell as appropriate and items of alternative manufacture (normally cheaper and possibly of a lesser quality) shall not be accepted

C.2.12 Continuous and Out-of-Hours Operation of Plant

Where a room or area such as an equipment room or constant temperature room requires continuously operating cooling or heating then consideration shall be given to the provision of independent plant rather than connecting to central plant, to avoid extended operation of a larger, central, system which could otherwise be controlled by a timeschedule.

Where a Lecture Theatre or similar facility is likely to be used or let for use beyond the normal timescheduled hours of operation for the building in which it is located consideration should be given to the provision of independent plant to avoid extended operation of the whole building. Where appropriate separately time controlled zoning may be employed to achieve this requirement.

The Estates and Facilities Division shall be consulted on this issue at design stage.

C.2.13 Fume Cupboards

Fume cupboard installations shall comply with BS EN 14175. The supply and installation of fume cupboards generally forms part of the construction contract.

Ensure that a standard fume cupboard requirement sheet (available from Estates and Facilities) is completed and signed by the User Department and design to meet those requirements. Copies of this form, with test certificates shall be submitted to the Chief Engineer in Estates and Facilities on completion together with advice of any existing fume cupboards removed. This information is essential to maintain the fume cupboard register required by legislation.

Projects with a single fume cupboard installation shall generally include a conventional constant volume type unit which shall be designed for an average face velocity of 0.5 m/s at 500mm sash height for a general purpose cupboard, and an average face velocity of 0.75 m/s at 500mm sash height for use with radioactive substances.

Alternatively (especially for multi-cupboard installations), specially designed low face velocity cupboards shall be considered for general purpose fume cupboards. The design shall be based upon an average face velocity of 0.3 m/s at 500mm sash height. Currently UCL accepts low face velocity fume cupboards from two manufacturers who have satisfactorily demonstrated the containment robustness test to BS EN 14175. The S+B "Ecoline" and the Waldner "Secuflow" are those currently approved. The colour and composition of the fume cupboard worktop shall be agreed top suit the users. The total exhaust volume for the Waldner cupboard needs to be 80m3/hr greater than the sum of the average face velocity to allow for the support fan volume which is a component of this cupboard. Construction details shall be discussed at an early stage as fume cupboards have many options and are generally on extended delivery.

Sash to be combination vertical and horizontal sliding (saves energy when work can be accessed through one door only)

Rear of chamber to be fitted with grid of scaffold mounting points.

Multi-cupboard installation Fume cupboards to be VAV controlled with sensors to determine both vertical and horizontal sash opening positions. Exhaust system to be designed for **100% diversity** in Chemistry (other locations to be discussed). VAV controller to have max response time of 3 seconds and to interface with make-up air controller. Fume cupboard to have proximity sensor to close sash after pre-determined absence time (variable up to 15 mins with sensor to stop sash if obstructed). Main exhaust fans to have VAV controlled ambient air intake to maintain required efflux velocity.

Simple face velocities measured at a grid in accordance with BS EN 14175 will suffice for site tests of single conventional cupboards. Maximum/minimum face velocities across the measurement grid shall not deviate from the average by more than 20%. Full containment tests are required on site for multi-cupboard installations in accordance with BS EN14175. These shall include inner and outer grid SF6 gas measurements.

Fume exhaust fans shall generally be direct drive units with inverter control for commissioning purposes.

Fume exhaust ducting shall generally be installed in PVCu ducting with the external sections GRP coated for mechanical protection and to reduce solar degradation. Other materials can be used where determined by a specific fume cupboard requirement. Fume exhaust systems shall be independent of, and NOT combined, with general extract systems.

Discharge stacks shall be a minimum of 3 metres high above the immediate roof level or, where a nearby roof level within a 15 metre radius on which maintenance or other personnel will stand is higher, then 3metres above that higher roof. Discharge stacks shall terminate with a high velocity cone giving an efflux velocity of 10 to 12 m/s.

C.2.14 Microbiological safety cabinets (MSC's)

Systems incorporating microbiological safety cabinets (MSC's) shall comply with BS 5726:1992 and BS EN 12469:2000.

MSC's are generally supplied and installed as part of the construction contract OR are supplied by the User Department. In either case the provision of all associated ducting and ancillaries and the integration into the overall systems shall form part of the construction contract. Ensure that on site containment tests as described in the BS are carried out and certificates issued to the User Department on completion.

Class 1 MSC's are similar to fume cupboards but have a HEPA filtered exhaust. Refer to manufacturers for the required exhaust rates.

Class 3 MSC's have full glove box protection

Class 2 MSC's have single HEPA exhaust filters where ducted to outside but shall have double HEPA exhaust filters in series where arranged to recirculate within a room. Although other methods of fumigation are available this is commonly carried out by boiling formalin to produce formaldehyde and provision shall be made to exhaust the fumigant on completion.

The Safety Advisory Office of Estates and Facilities shall be consulted to confirm if a room recirculation cabinet is appropriate for particular works carried out by a User Department.

Estates and Facilities should be consulted to discuss and agree the options for exhaust ventilation from MSC's. Exhaust systems shall be independent of, and NOT combined, with general extract systems.

See also "The management, design and operation of microbiological containment laboratories" by the Advisory Committee on Dangerous Pathogens (ACDP) published by HSE books.

C.2.15 Microbiological laboratories

Microbiological laboratories shall be designed to the requirements of category 2 of "The management, design and operation of microbiological containment laboratories" by the Advisory Committee on Dangerous Pathogens (ACDP) unless identified as a higher grade.

C.2.16 Containment level 3 (CL3) Laboratories

Where identified as a containment level 3 laboratory this shall be designed to the requirements of CL3 of "The management, design and operation of microbiological containment laboratories" by the Advisory Committee on Dangerous Pathogens (ACDP)

Estates and Facilities should be consulted to discuss UCL specific requirements for these laboratories. These requirements include:

- The exacting standards of workmanship and design necessary to achieve a room which is completely sealable, without re-entry, in the event of an emergency fumigation being necessary following a spillage or similar accident. Service entries to be sealed with formaldehyde resistant mastic and ventilation ducts to have motorised gas tight dampers.
- Provide duplicate extract fans, with automatic non-return dampers, to ensure that an inward airflow to the laboratory is maintained during work with pathogens. Duty share changeover shall take place by running both fans simultaneously before dropping out the duty fan.
- Typical pressure regimes to be based upon the lobby/prep room being at -20pa relative to the corridor and the laboratory a further -30pa relative to the lobby/prep room (i.e. laboratory -50pa relative to external). This shall be controlled and regulated using pressure weighted non-return air transfer dampers.
- Extract fans to be wired to a maintained supply where available.
- Extract fans to be inverter controlled, with velocity sensor control, to maintain the design extract rate as HEPA filters become dirty.
- Provide HEPA filters in any extract connections from the laboratory where not already included as part of a safety cabinet exhaust.
- Provide a safe change HEPA filter in the extract at the common point of exit from the laboratory or in the ducting before the extract fan set. This is for additional protection of maintenance staff working on the remote extract fans etc.
- Where possible, all maintainable plant shall be located outside the laboratory.
- Make up air supplies shall be fitted with non-return dampers to prevent reverse airflows and constant volume devices. Supply diffusers shall be designed to avoid draughts across the face of MSC's, which might otherwise effect containment.
- Supply fan to be interlocked with extract fan such that extract must be proven to run before enabling supply. This can result in high negative room pressures at start up and the designer shall ensure that the Architect is advised of the resultant loadings on the structure (particularly relevant to suspended ceiling support).
- MSC's to be connected to extract system. MSC's to be arranged to continue to operate in the event of main extract fan failure but alarms shall be provided with a clear label to advise that Users should carry out an immediate controlled shut-down of work.
- Provide electrical isolation for the MSC's in the lobby outside of the laboratory.

- Provide dedicated power sockets within the laboratory for formalin kettles. These sockets to be located close to the door so that a kettle can be plugged in by leaning into, rather than entering, the laboratory and to be switched from the lobby.
- Provide pressure differential alarms, clearly labelled, to advise the Users if the negative pressure is not maintained. Provide time delay to allow for opening of door for entry/exit. Provide magnahelic gauges for ready visual indication.
- Locate control panel for category 3 system in lobby/prep room for operation of systems in emergency, including control of fans, motorised dampers etc. The systems shall operate "on demand" at the local panel and not be over-ridden by a timeschedule on the central BEMS. The BEMS shall be configured for monitoring only of this panel.
- Ventilation to be designed for full fresh air. Extract rate to exceed make up air rate and to be greater than sum of MSC exhausts. Rates to be increased if necessary to allow sufficient air changes to deal with room cooling loads.
- Provide 10mm (100 mm long maximum.) test port through laboratory door, with cap on lobby side, for testing for residual formaldehyde following fumigation.
- Carry out smoke tests on completion to validate air-tightness for fumigation.
- Consult with users to establish whether lone working is anticipated and provide "lone working" alarms as appropriate.
- Provide gas tight dampers in ducting outside the laboratory for fumigation and ensure that no non-airtight items such as heater batteries are positioned on the laboratory side of these dampers.

C.2.17 Plant Maintenance

The first year maintenance of "primary plant" within the defects liability period shall be included within the project. This is particularly relevant to plant where the guarantee is dependent upon a prescriptive maintenance schedule such as chillers, boilers, compressors, etc.

C.2.18 Water hygiene risk assessments/method statements

To satisfy the provisions of the Health and Safety at Work Act and specifically L8 –The control of legionella bacteria in water systems - the Employer will not accept handover of the installations until full and adequate information concerning the installations is in the possession of his operating and maintenance staff.

Designers shall carry out their own risk assessments at design stage and consult with the UCL approved specialist as necessary.

The designer shall specify that the contractor shall employ a specialist to carry out risk assessments of the water systems and to prepare a method statement, for inclusion in the O&M manual, for maintenance of the control of legionella bacteria.

The specialist shall be:
Environmental Hygiene Services
Unit 5, Riverside Business Park,
Dogflud Way, Farnham, Surrey
GU97SS
Contact Domenic Santacaterina (tele: 01252 735454)

The risk assessment shall cover the whole of the systems in new build situations and where dedicated systems are installed to serve a refurbished area.
In refurbishments where the existing systems are adapted then the risk assessment shall comprise a review/revision of the current assessment and method statement for the building. This requirement shall not apply should the works be limited to relocation of one or two draw-offs unless such minor works include a shower or similar atomizing spray device when this requirement shall apply.

C.2.19 Plant and services adjacent to project site.

Roof works on new projects shall take full account of existing services on the same or adjacent roofs. An example would be where existing fume extract discharge stacks may need to be raised to comply with the clearances stated elsewhere in this document and existing fresh air inlets may be affected by new fume exhausts.

Where construction of a project may affect the maintenance, operation and reliability of existing plant then risk assessments shall be carried out and appropriate measures specified and costed in the project. Examples would be:

(a) Arranging to turn off air handling systems if possible where dust or fume is generated by the works and/or changing of air filters every 2 weeks whilst such work is in progress.
(b) Protecting existing condensing units or chillers whilst still allowing sufficient free air flow and cleaning of the condenser coils during and after such work.

C.2.20 Pressure gauges and thermometers

Regardless of the fact that systems may have sensors giving readings to a BEMS system pressure gauges and thermometers shall be provided to facilitate maintenance and fault finding without access to a PC.

Pressure/altitude gauges shall be fitted to at least the inlet and outlet of circulation or booster pump sets, heat generation plant, buffer and expansion vessels.

Thermometers shall be fitted at least to each storage vessel, chilled water F&R, heating F&R, heat generating plant, HWS F&R, supply and fresh air ducts and extract ducts where recuperation is employed adjacent to air handling units, and in cold water storage cisterns.

C.2.21 Electrical power supplies to pumps

Where practical final power connections to pumps shall be made using Commando type sockets with integral isolator switches to enable ready disconnection and removal by maintenance fitters without the need for the attendance of an electrician

VERTICAL TRANSPORTATION
SECTION D - CONTENT

D.1 PASSENGER/GOODS LIFTS

Vertical Transportation

D.1 Passenger/Goods Lifts

D.1.1 General

This design brief covers the requirements for any new lift installation installed at University College London. This will include the supply, delivery, errection, fitting, testing and commissioning and consultants witness testing of all equipment and associated materials and plant.

The aim of this design brief is to ensure that all equipment is generic in design and is not special to any lift contractor. It shall be ensured that all spares will be supplied by a independent third party supply chain.

Passenger lifts shall be designed and installed to be readily maintainable by competent independent lift engineering companies.

Motor drive systems shall be variable frequency. Above 0.6m/s they should have closed loop feed back.

Control systems shall be fully collective. In some cases such as residences this will need to be reviewed and will be dependent on the building design.

Car entrance and landing doors shall be two panels centre parting.

Minimum lift size shall be 1100 wide, 1400 deep, and 2200 high. Car shall have two recessed luminaries with emergency light converter. Car finishes shall be robust and suitable for the environment the lift has been installed into.

The minimum entrance size shall be 900 wide and 2000 high. The entrance size may increase dependant on the lift use requirements.

A Fire Alarm recall facility is required. When activated the lift shall return to the designated floor, where it will allow passengers out and then the lift will shut down. The car door open button and main floor landing call button shall remain operative.

Once the lift installation has been fully completed and prior to handover to UCL the lift installer shall carry out emergency release training to UCL staff. A certificate shall be issued to each individual person confirming training has been completed satisfactorily.

During planning of the lift facility for a building a traffic analysis and disabled access assessment shall be carried to establish the number of lifts required together with the performance requirements of the lift. This will establish the lift speed and size and duty requirements.

The following list of components and suppliers gives the preferred specialists to meet the requirement to be readily maintainable by, and for spares to be readily available to, competent independent lift engineering companies.

Hoisting Machines
Sassi.
Ziehl-Abegg
Loher

Motors
Loher
Sassi
Ziehl-Abegg

Pulleys & Divertors (Cast Iron Only)
Hollister Whitney
Sassi
Monitari

Door Operators and Door Operating Equipment
GAL MOVF
Selcom VF **(Light Duty Installations)**
Sematic **(Light Duty Installations**)

Control Systems
Liftstore
International Lift Equipment (MRL's only)

Shaft Detection Systems
Tape Head same manufacture as controller.
Liftstore

Limit Switches
Kronemberge FES.

Push Buttons
Liftstore

Indicators
Red Dotmatrix 50mm Character on the Car and 30mm on the landing.
Lift Store
Stentorgate

Communication Equipment
Windcrest

Door Detectors
Memco

Pump Units For Hydraulic Lifts
Bucher with LRV electronic valve.

Rams for Hydraulic Lifts
Bucher

Emergency Communication Systems for evacuation lifts and fire fighting lifts
Windcrest

D.1.2 Drive Unit

Variable Frequency Motor
The motor shall be induction AC type incorporating forced ventilation.

The control of the motor shall be achieved, through power transistors, by finite adjustment to the frequency and voltage of an AC power supply through a Pulse Width Modulator incorporating four-quadrant regeneration.

The inverter drive shall meet the harmonic limits laid down in the current Electricity Council Recommendation and must fulfil all radio interference requirements.

The motor and its control shall be compatible to the power supply to the machine room and is to incorporate a sound filter to dampen the Pulse Width Modulator enabling the Lift to run at all loads/speed without appreciable noise or hum.

The motor control shall be by means of either an Open loop up to a contract speed of 0.63 m/s or a Closed Loop System incorporating a speed regulator that must be fully adjustable to give optimum performance throughout the intended travel of the Lift.

The regulator will respond to feedback signals derived from the motor speed, motor voltage, distance to travel and load within the Lift car.

The system is to have an accurately controlled method of controlling rate of change in acceleration. The acceleration should initially be set at 0.8 mps^2 and it shall be adjustable between 0.8 mps^2 and 1.2 mps^2.

The motor control shall incorporate direct floor approach and stopping, with the machine brake being applied only after the car is stationary.

The system shall maintain its speed between -2% and +2% of its designed operating speed.

Protection to the motor windings shall be in the form of thermistors with additional protection provided by the inverter should any of the following occur:

1. Over-current in the drive circuit
2. Over-voltage of the intermediate circuit
3. Under-voltage of the intermediate circuit
4. Network voltage asymmetry not correct
5. Temperature rise of the semi-conductor cooling plates
6. Regulator electronic voltages incorrect
7. Operation of the electronic braking network incorrect
8. The speed of regulator becomes saturated

The motor shall bear the actual manufacturers name and data plate. All motor terminals shall be readily accessible and of screw fixed or bolted design located within a terminal box.

Lifting eyes are to be provided to the motor casing.

The motor shall be rated for a Lift duty of 180 starts per hour.

Motor bearings shall be of the roller type.

In the event the driving machine requires site assembly it must be carried out by the manufacturer or approved agent.

The levelling accuracy shall have a tolerance of +/- 3mm.

The tacho-generator or other means of speed reference shall be so sited that easy access is provided and the items are not subject to accidental damage.

In the event of loss of tacho-generator feedback under normal conditions and on car top control the Lift will immediately shut down and the brake will be applied. The Lift will no longer attempt to respond to calls until tacho-feedback has been reinstated.

Where the handwinding wheel is separate from the driving machine, tacho-generators or other feedback encoders should not be mounted at the motor end of the high-speed shaft necessitating their removal for handwinding purposes.

Brake
A brake switch shall be installed to the brake. This switch shall prove that the brake has lifted prior to the main drive unit motor being energised. If the brake does not lift the main drive unit motor shall not move the lift.

D.1.3 Control System General Requirements

Control Cabinet
The control panel shall be of the steel enclosed cabinet type with louvred ventilation, internally and externally finished in powder coating or plastic skin plate. The identity of all the contactors, relays, solenoids, and other equipment in the controller shall be clearly indicated by means of permanent, heat resistant non-fade, plastic labels. Dymo or similar will not be acceptable. A key to abbreviations and symbols used will be affixed to the inside of the controller or controller door.

Access shall be from the front only unless complexity of equipment necessitates rear entry also. The doors shall be full height and width of the panel and shall be of double hinged mechanically latched type.

The enclosure shall provide protection to IP23 Standard.

Two external lifting eyes are to be fitted to the top of the controller cabinet to allow lifting without distortion.

All resistors are to be mounted externally to the main control equipment in a housing mounted to suit the site conditions with suitable ventilation.

Doors shall not be of the lift-off type and shall be separately earthed.

A notice shall be permanently affixed to the controller door detailing the final torque settings entered on to the main drive inverter.

Where location dictates, control panel(s) shall be sound isolated.

Control Components
The system shall be microprocessor controlled.

The microprocessor section of the control panel shall be separately mounted, such that the inadvertent connections of high voltages or physical damage from falling objects are prevented.

All input/output lines must be capable of withstanding short circuits and the application of 500v for short duration i.e. megger tests, without permanent damage.

An electronic, non-resettable, permanently displayed digital trip counter shall be provided to record the number of journeys for the lift.

Each control panel is to be provided with a visual display showing the operating status of the Lift and incorporating LED indicators which show each of the following sequences:

Power on
Power to each processor board
Lift in service
Lift direction
Calls registered for car and landing
Door open/door close
Safety edge operation
Lift overload
Lift on car preference
Lift on door hold

The control cabinet shall be provided with an external changeover switch to convert from NORMAL to INSPECTION operation, together with UP and DOWN buttons, and an OVER-RIDE button.

When switched to INSPECTION all safety circuits will be in use. On operating the continual pressure OVER-RIDE button, the safety gear switch on the car, buffer switches, over travel limits, governor switch and governor tension weight switch will be over-ridden. This OVER-RIDE button is to assist in the release of the safety gear or to move the Lift from the overtravel limits.

This INSPECTION/NORMAL switch will NOT OVER-RIDE the mechanics control station or any other part of the safety circuit.

For each individual Lift a MAINTENANCE/NORMAL SERVICE switch is to be provided on the control panel which will prevent the Lift answering its landing calls.

A door isolation switch will be provided which will prevent operation of the car doors.

A key operated switch shall be provided to operate the overspeed governor (remote overspeed governor).

Where the preferred method for interrogating the lift control system when fault finding or altering the lift operating parameters is by the use of a portable or hand held device, **then any such device shall be permanently located within the controller cabinet and shall become the employers property.** It shall be site specific and any unique identification number shall be recorded on the device.

Special cooling and/or filtration equipment is to be incorporated to reduce the spread of dust through the controller and to maintain satisfactory ambient temperatures and prevent local hot-spots.

The following items are required:

Phase failure/phase reversal protection
Double journey timers
Automatic homing [switched]
Door nudging with audible signal
All control equipment to be protected by miniature circuit breakers not fuses
Door open/door close timers fully adjustable for dwell and operating speeds

Anti-interference features for all car controls
Earth terminals and full earth bonding
Supplies to printed circuit boards shall be protected by miniature circuit breakers
Microprocessor based car position reference system
Thermal overloads for main motor protection or alternatively protection within the controller software
Car and landing door lock short-circuit protection
A device shall be fitted that determines the lift machine and machine room temperature.
An over temperature will cause the lift to shut down at the next floor in a controlled manner.

Suitable outputs shall be provided to provide speech generation. The processor shall provide advanced signals to highlight such items as "Doors Closing" etc.

In the event of loss of tacho-generator feedback under normal conditions and on inspection control the Lift will immediately shut down and the brake will be applied. The Lift will no longer attempt to respond to calls until tacho-feedback has been reinstated.

The door open button within the lift car shall illuminate during the door closing cycle.

Equipment Reliability
The control circuit where fed from an alternating current source shall be greater than 100V and not greater than 240V.

On relay components the "VOLTAGE RELIABILITY" shall be at least 80%, ie the control circuits must operate at 25% below design voltage.

The "COMPONENT RELIABILITY" shall not be less than three million, ie the expected number of operations between two failures.

All timers shall be of solid state design.

All car and landing control indicators will illuminate until their call is answered by the lift.

The lift should not interfere with the reception of radio and television programmes or the supply of computer-related equipment. The lift equipment shall be fitted with the necessary interference suppression and filtration components during manufacture.

Car position reference systems shall be actuated by one of the following:

Shaft encoders
Transducers

Any other proposed system shall be with the approval of UCL.

Car Preference
Car preference operation will be provided. With the key in the ON position the Lift will be removed from NORMAL operation and will respond only to car calls and will ignore all other automatic operations. The key will be captivated when in the "ON" position.

When under car preference the Lift will park with both car and landing doors open.

The Lift will respond to continuous pressure on the selected car floor push only and only the first call will be answered. For any subsequent call it will be necessary to press the car button to achieve further door closing.

Wiring Diagrams

Contract specific plastic encapsulated wiring diagrams are to be provided within the machine room in addition to those provide within the O & M Manuals.

D.1.4 Fully Collective Control

Following registration of a landing call, the Lift will respond to that call only when it is travelling in the direction of the call.

It will store this call in memory if travelling in the opposite direction and answer it sequentially when travelling in the direction of the call.

If the Lift responds to a floor where both UP and DOWN calls are registered it will respond only to the call in the direction in which it is committed to travel.

If no car call is then placed and there are no further hall calls in that committed direction, the doors will re-open and its committed direction will reverse and it will respond to the other call.

Car calls will be answered sequentially as their destinations are reached irrespective of the order in which they were registered. As each car call is answered it will be cancelled.

Each controller is to incorporate automatic logging which will have an indicator display board to show a record of events covering the following Lift functions:

Primary safety circuit failure
Primary loop failure
Car door switch fault
Landing door lock fault
Failure of doors to open
Lift overloaded condition
Landing and car calls cancelled
Shutdown due to successive failed attempts to start
Limited force door closing having been operated
Memory failure
Programme error
Stuck landing/car call button
Service to engineers visit
Two spare signal/record facilities

D.1.5 Handwinding System

An electronic handwinding system shall be provided which shall incorporate both audible and LED illumination. The equipment shall be wall-mounted adjacent to its corresponding hoisting machine and shall be easily viewed from the normal handwinding position.

A control switch mounted on the handwinding unit shall initiate the operation of the handwinding system. When switched "ON" and under handwinding operation, it will indicate both visually and audibly as the Lift becomes level with a landing floor level. The unit shall display the position of the lift car relative to the nearest landing.

Supply to the handwinding system shall be from an independent low-voltage source incorporating an emergency supply which automatically becomes available in the event of mains power failure.

Irrespective of the position of the mains supply switch, the operation of the switch on the handwinding buzzer system shall render all other controller components inoperative and an illuminating indicator should be sited adjacent to the handwinding switch to notify that the buzzer system is switched on.

D.1.6 Mechanics Control Station

The car top control station panel shall be mounted vertically within 1000mm of the landing entrance and easily assessable from the landing. (In the through car condition it shall be assessable from the side with the majority of landing entrances)

The mechanics control station on the car top shall contain maintenance and testing switches, direction push buttons, a 13amp switch socket outlet with RCD protection, and a proprietary brand of 16 watt twin fluorescent bulkhead light fitting with polycarbonate or similar shatter resistant diffuser.

The light fitting shall also be provided with an emergency power source from an independent supply of 3 hours duration. This unit shall be sited on the car top.

It is permissible to feed the emergency car lighting from this source provided that a 3-hour duration is maintained in each case.

All car top lighting and power points shall come from a common source but shall be individually fused.

All switches and push buttons shall be clearly marked with their functions.

Operation of these switches and push buttons shall be as follows:

Roof Light Switch
Control of Roof Light

Shaft Light Switch
In addition to the shaft lighting switch circuits in the motor room and lift shaft, an intermediate switch shall be incorporated in the mechanics control faceplate, which will provide the shaft lighting system with a third point of operation.

Emergency Stop/Run Switch
The emergency stop switch shall be a push/pull type (push to stop pull to run). The button shall be at least 50mm in diameter and coloured red. The stop button shall be proud of its shroud only in the "run" position.
The button shall show visual indication of both operational positions and incorporate the word STOP placed on or near it.
The button shall be position at the extreme top right position on the car top control panel.

Inspection/Normal Operation Switch
NORMAL - Normal operation
INSPECTION - Car and landing push buttons isolated: push buttons on mechanics control panel become operative, and the Inspection/Normal Operation switch becomes illuminated. This words NORMAL and INSPECTION shall be marked on or near the switch.

The switch is to be protected against involuntary operation and a bi-stable design. The switch shall be shrouded.
The switch shall be positioned in the extreme top left on the car top control panel.

Door Control Switch
The words DOOR OPEN AND CLOSED placed on or near the switch and shall be position to the extreme bottom left on the car top control panel.

Up, Run and Down direction buttons
The up direction button, the run button and the down direction button shall be arranged centrally and vertically in line with the up direction button positioned at the top of the car top control panel.
These shall operate car in the UP or DOWN direction (only while the respective direction button and the intermediate run button are depressed). These shall operate under constant pressure.

Engineers Alarm Button
An enshrouded continuously illuminated alarm push in yellow and engraved **alarm** over a red back ground and located below the stop button.

A mechanically operated UP inspection limit is to be incorporated in the control circuit so that when the INSPECTION switch is in the INSPECTION position and the UP button is depressed, the car shall stop at the top of the lift shaft low enough to ensure that a 2 metre tall person standing on the top of the car shall be in no danger of coming into accidental contact with any overhead equipment or structure. Immediately after the UP test limit has been set and checked for final position the limit supporting arm, in addition to the conventional clip fixings, is to be twice pinned through the guide flange. In addition, a notice is to be fitted with the wording WARNING - DO NOT MOVE UP INSPECTION SAFETY LIMIT.

All controls shall be fully shrouded and sensibly positioned, accessible and no further than 1 metre from the entrance.

D.1.7 Defects Liability Maintenance
Routine maintenance for each of twelve calendar months from the Main Contract Practical Completion date, i.e. during the Defects Liability period, shall be included in the project.

This shall include the cleaning, oiling, greasing and adjustment of al1 parts of the lift system, to maintain as far as possible the accuracy of the operation as stated in this specification.

The lift machine room floor, walls, pit and well shall be kept free of oil, grease and rubbish and shall be left in a tidy manner after maintenance.

The Contractor shall renew all lamps in pushes and indicators that are found defective at the time of the maintenance visit.

Throughout the initial twelve-month maintenance period the Lift Sub-Contractor shall allow for providing suitably qualified personnel to answer any breakdown calls at no additional charge.

The maintenance shall include for callouts 24 Hours a day, 365 days per year Monday to Sunday, including Bank Holidays. Response time from receipt of advice of a breakdown to arrival on site to be two hours or less.

A log card shall be provided by the Lift Sub-Contractor to record maintenance visits, inspections, breakdowns, repairs, etc. This log card shall normally remain in the lift machine room and shall be the property of UCL

Maintenance and Guarantee Schedule

Within a week of completion of the lift system, the Lift Contractor shall prepare a simple schedule, defining the guarantee and maintenance arrangements for the initial twelve-month maintenance period, suitable for presentation to the building tenant.

D.1.8 Machine Room Less Lifts

In addition to the aforementioned requirements the following specification for machine-room-less lifts shall be provided. Generic lift equipment from the approved suppliers list shall be used.

Guides
Guides shall be positioned in a conventional layout with one guide each side of the lift car and separate counterweight guides. All guide fixings shall be independent of each other.

Type of Roping
The preferred roping layout for the lift shall be 2:1.

Drive Unit
The drive unit shall be a gearless unit.

The drive unit shall be mounted within the lift well suitably mounted so that it can be easily maintained. If mounted within the lift pit the drive unit shall be mounted at least one metre above the pit floor.

Where Fire Fighting lifts are specified the drive unit shall be positioned at the top of the lift shaft.

Controller
The controller shall be as detailed in D.1.1. It shall be capable of being positioned anywhere within 5 metres of the lift well. The controllers shall be positioned within a suitably sized secure room where the equipment can be worked on safely. There shall be at least 1 metre x 1 metre of free working space in front of the controller.

Lift electrical services and the lift mains supply shall be provided in the controller room.

A 200mm square straight duct shall be provided from the controller room to the lift well. A draw wire shall be left in the duct if it is over 1 metre long.

Handwinding

An electronic handwinding system shall be provided which shall incorporate both audible and L.E.D visual indication of when the lift is at floor level.

A control switch mounted on the control cabinet shall initiate the operation of the handwinding system. When switched "ON" and under handwinding operation, it will indicate both visually and audibly as the Lift becomes level with a landing floor level.

Supply to the handwinding system shall be from an independent low-voltage source incorporating an emergency supply which automatically becomes available in the event of mains power failure.

Irrespective of the position of the mains supply switch, the operation of the switch on the handwinding buzzer system shall render all other controller components inoperative and an illuminating indicator should be sited adjacent to the handwinding switch to notify that the buzzer system is switched on.

The lift shall be driven to floor via buttons in the controller cabinet. The system should work for at least two independent floor travels in the event of power failure.

Counterweight Frame
A conventional counterweight frame must be employed on the lift. The counterweight shall weigh a value equal to the lift car weight + 50% of the contract load.

D.1.9 Hydraulic Lifts

In addition to the aforementioned requirements the following specification for hydraulic lifts shall be provided.

Guides
Guides shall be positioned in a cantilevered arrangement up to a Lift Contract Load of 8 Persons 630 Kg. Above this contract load the car guide rails shall be positioned either side of the Lift Car.

Ram/Cylinder
Up to a Lift Contract Load of 8 persons 630 Kg a single ram may be employed. Above this contract load at least two rams shall be employed.

Type of Roping or Chain Layout
The roping/chain layout for the lift shall be 2:1 rope/chain suspended.

Drive Unit
The drive unit shall consist of a steel fabricated tank with rubber isolation between its feet and the floor. The unit shall incorporate a submerged motor and screw pump. The control valve shall be mounted to the top of the tank and shall incorporate closed loop feed back technology. The drive unit shall incorporate as a minimum a hand pump, a pressure gauge, a manual lowering facility and high and low pressure switches. A low pressure protection facility will prevent the lift being manually lowered if the working pressure to the ram is reduced to below the minimum allowable working pressure. It shall be designed as a minimum to be able to cope with 60 motor starts per hour.

Machine Room
A machine room shall be provided. It shall incorporate the drive unit, controller, and Lift Electrical services. The machine room shall be suitably heated and ventilated to dissipate the heat generated by the lift equipment.

Lift Speed
Hydraulic lifts shall not exceed a contract speed of 0.6 m/s.

D.1.10 Evacuation Lifts

Where evacuation lifts are installed the following is required as a minimum.

Controller.

The controller shall comply fully with the requirements to function as an "Evacuation Lift" and as detailed within BS9999.

In the event of power failure the control system shall "remember" what floor the lift is on.

Communication.

A communication system shall be installed between the machine room, the lift car and each landing. The master communication panel shall be installed at the main fire access level and it shall be possible from this floor to contact and speak to any other communication panel.

All other communication panels shall be able to contact and speak to the master panel.

The communication panel shall incorporate a "euro" type key switch, which when activated will instate the communication system and switch on the evacuation control mode of the lift.

Secondary Back Up Power Supply.

A secondary back up power supply for the lift in accordance with BS9999 shall be provided.

WHEN INSTALLING AN EVACUATION LIFT IT SHALL BE TRACTION DRIVEN.

D.1.11 Fire Fighting Lifts

Fire fighting Lifts shall be designed in accordance with current standards and Regulations.

All the requirements covered within this design brief shall be met apart from the following differences:

When installing Machine Room- Less Lifts, the drive unit shall be positioned at the top of the lift shaft and the roping arrangement can be 1:1 if required.

Position Indicators shall be of UK third party supply suitable for the temperature range needed to comply with this standard.

D.1.12 Platform Lifts

Platform lifts shall comply with BS6440.

The maximum vertical travel shall be 4 metres.

The minimum size of the platform shall be 1100mm wide x 1400mm deep for vertical platform lifts and 900mm x 1200mm for stair platform lifts.

The platform must be directly driven through a mains supply and must not rely on batteries that are charged when the platform is not in use.

Platform Lifts shall only be installed where it is not practical to install a conventional passenger lift.

D.1.13 Stair lifts

Stair lifts shall comply with BS5776.

The Stair Lift must be directly driven through a mains supply and must not rely on batteries that are charged when the platform is not in use.

A stair lift must only be installed as a last resort.

D.1.14 Energy saving features

Every lift installed shall incorporate the following features to reduce power consumption when the lift has been idle for a pre-determined time:

Car lighting
If the lift car remains idle for more than 15 minutes the car lighting shall automatically switch off. The lighting shall switch back on if any car or landing call is entered or a fire alarm recall signal is received by the controller. If the alarm button is pressed then the car lighting shall remain on.

Car lighting shall be of low energy light fitting such as L.E.D Down lighters, fluorescent down lighters or fluorescent tubes.

Inverter Sleep Mode [Variable frequency drive lifts only]
If the car remains idle for more than 15 minutes the drive system inverter shall shut down and go into sleep mode. If a car or landing call is entered or a fire alarm recall signal is received by the controller the inverter shall be reinstated to full functional order.

Regeneration System.
If required and detailed within a particular project all lifts shall incorporate a regenerative system on the lift drive that enables unused energy to be returned to the mains supply.

[CLAUSE D.1.14 IS NOT APPLICABLE TO PLATFORM LIFTS OR STAIR LIFTS,]

D.2 STANDARDS & REGULATIONS FOR LIFTS

The installation shall as a minimum conform with the following where applicable together with any current amendments or updates:

1. *British Standard Specifications series 5655 that are still current..*
2. *BS EN81 1 & 2 1998 Safety Rules for the construction and installation of lifts.*
3. *BS EN81-3 2001 Safety Rules for the construction and installation of electric and hydraulic service lifts.(When service lifts are fitted)*
4. *Guidelines on the supplementary testing of in-service lifts 2006.*
5. *IEE Regulations current edition.*
6. *Low voltage electrical equipment (Safety) Regulations 1989.*
7. *PM26 Safety at Lift Landings.*
8. *Supply of Machinery (Safety) Regulations 1992.*
9. *The Construction (Design & Management) Regulations 2007.*
10. *The Electric Equipment (Safety) Regulations 1994.*
11. *The Electro Magnetic Compatibility Regulations 1997.*
12. *The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER).*
13. *The Lift Regulations 1997.*
14. *BS EN81-70: 2003 - Safety Rules for the construction and installation of lifts – Particular applications for passenger and goods passenger – Accessibility to lifts for persons including persons with disability. (To be complied with in full unless Dimensions do not permit)*
15. *BS EN81-28: 2003 - Safety Rules for the construction and installation of lifts – Lifts for the transport of persons and goods – Remote alarm on passenger and goods passenger lifts.*
16. *BS EN294: 1992 Incorporating Amendment 1- Safety of Machinery – Safety distances to prevent dander zones being reached by the upper limbs.*
17. *BS 8300: 2001 - Design of buildings and their approaches to meet the needs of Disabled people – Code of practice.*
18. *BS ISO 4190 Part 1: 1999 - Lift installations Class I, II, III, and VI lifts.*
19. *BS ISO 4190 Part 2: 2001 – Lift installations Class IV lifts.*
20. *BS7255:2001 – Safe Working on lifts. (All new passenger and goods/passenger lifts shall comply)*
21. *BSEN81-72: 2003 – Safety Rules for the construction and installation of lifts – Particular applications for passenger and goods passenger lifts – Part 72 Fire Fighter Lifts. (Where Fire Fighting Lifts are required)*
22. *BS5588: Part 8: 1999 – Fire precautions in the design, construction and use of buildings – Code of practice for means of escape for disabled people. (Where evacuation lifts are required)*
23. *BS5776: 1996 – Specification for Stair Lifts*

    BS6440: 1999 – Powered Lifting Platforms for use by disabled persons.